N.E.L.A. Convention Issue

MAY 21 1923

# Electrical World

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# Electrical World

*The consolidation of Electrical World, Electrical Engineer and American Electrician*

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W. H. ONKEN, JR. Editor

HAROLD V. BOZELL Editor

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# Pre-eminence of New York in Use of Electricity

THE pre-eminence of New York City in the Western Hemisphere is beyond all cavil or question. Faith, learning, character and competence in business have brought her this distinction. Among all the cities of the world also she fills a role peculiarly hers. This applies to her harbor, her towering buildings, her public works and also to her system of electrical supply. Not that the latter exceeds in efficiency other large systems, for no city has a mortgage on all science, initiative, genius or brains; but by reason of its teeming population and restricted area more electricity is used in New York City than in any other city in the world.

Those who attend the convention of the National Electric Light Association, if they seek, will find hidden treasures of applied electricity on all sides. Outwardly the manifestations are scarcely visible except at night, for there are no wires to be seen overhead and, indeed, there is hardly enough space to spare for them underground, so encumbered is the earth with subways, water pipes, gas mains, sewers and the myriad cables of the telegraph, telephone and electricity supply companies.

The accounts given in this issue of the features of the various generating systems are necessarily brief. A volume could be written about the precautions taken to guarantee service alone, for the railroads, the street railways and even the isolated plants in every emergency caused by mishap to their own systems cast their loads on the mains of the central-station companies. And the wonderful thing about it is that the latter have never failed them. But there are other phases of the electricity supply business just as exacting and just as interesting to both engineers and executives which will repay investigation.

As for growth, the new building program of New York is so immense that the electric light and power companies are hard pressed in extending their mains and installing the service. Few companies can show larger increases in new meters connected or in accretions to gross revenue, and there are no signs of let-up. Clear perception of the facts is necessary for a just appreciation of the work of the electric light and power companies in the metropolitan district. Bigness is one chief characteristic; the unostentatious self-confidence and apparent ease with which great results are accomplished is another.

# Leading Central Station Men of New York

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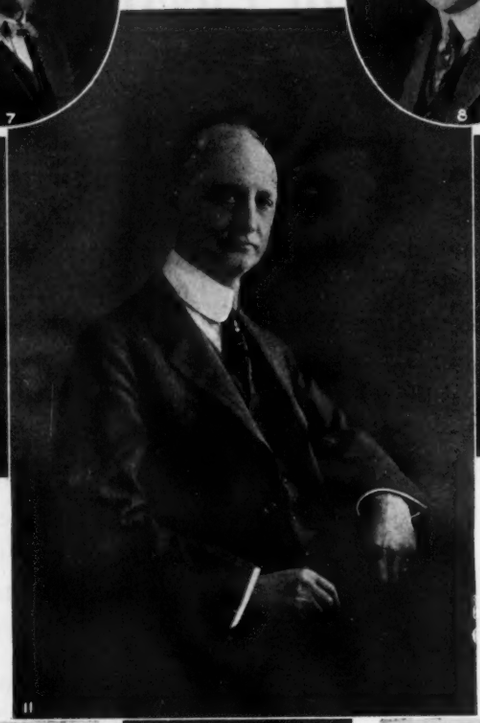
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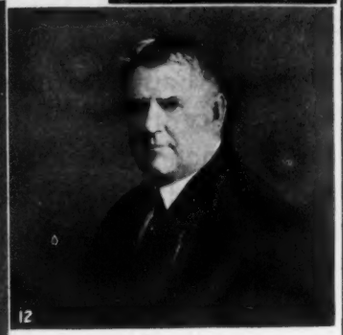
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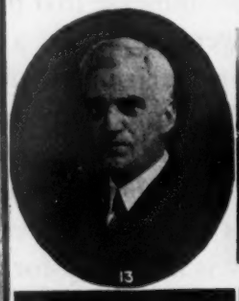
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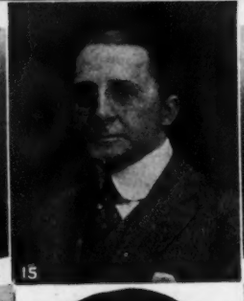
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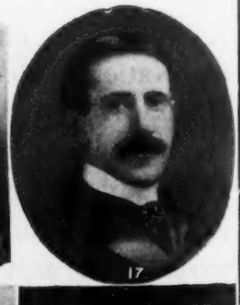
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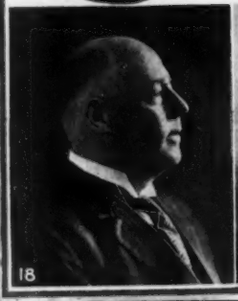
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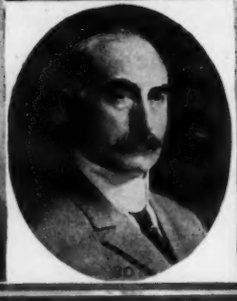
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# Editorial Comment

Electrical World, May 26, 1923

Volume 81 Number 21

### Progress Unimpeded, Growth Prodigious

THE N. E. L. A. convention of 1923 will long be remembered because it fell in a year which saw the beginning or the completion of so many great electric power houses. Readers of this paper are familiar with the tale of Crawford Avenue piled on Calumet, of Trenton Channel doubling Connors Creek, of Hudson Avenue added to Gold Street, of Kearney o'ertowering Essex, of Devon and Weymouth, Delaware and Saxton, Cahokia and Philo, High Bridge and Zilwaukee, Peoria and Wabash, of Niagara and Pit River, St. Croix and Boulder and Mitchell Dam—the list of familiar names could be extended almost indefinitely.

As estimated in a tabulation appearing in News of the Industry this week, the largest steam and hydroelectric stations under way or just completed, together with extensions to existing stations, reach a total rating of 3,500,000 kva. and a total cost of approximately half a billion dollars—and the innumerable small stations all over the land are not included.

The convention of such an industry as this in such a year as this cannot but be full of interest, of enthusiasm and of profit. With such prodigious growth, such unimpeded progress, there are problems worthy of the best of men to solve. The annual convention of the N. E. L. A. assists in no small measure not only the individual's own accomplishments but the collective or group action so necessary in the proper progress of the industry. The convention this year cannot help but be memorable. Every one who can should attend.

### Reproduction Cost as an Element in Valuation

ONCE again the United States Supreme Court has declared that no adequate determination of fair value can be arrived at without due consideration being given to reproduction cost on the basis of present-day prices. The latest pronouncement of the court in this regard is embodied in a decision in the case of the Southwestern Bell Telephone Company of Missouri handed down on Monday of this week. But it should also be noted that the Supreme Court does not hold that reproduction cost alone is the measure. In fact, the words of the court—"An honest and intelligent forecast of probable future values, made upon a view of all the relevant circumstances, is essential"—sound in tone much like those used in the famous case of Smythe vs. Ames, when the court said:

> . . . The basis of all calculations . . . must be the fair value of the property. . . . The original cost of construction, the amount expended in permanent improvements, the amount and market value of its bonds and stock, the present as compared with the original cost of construction, the probable earning capacity of the property under the particular rates prescribed by statute, and the sum required to meet operating expenses, are all matters for consideration and are to be given such weight as may be just and right in each case. We do not say that there may not be other matters to be regarded in estimating the value of the property.

Justice Brandeis, in a separate opinion, urges the money invested in the enterprise as a preferable basis, asserting that advocates of reproduction cost will find its application harmful when wages and costs are lower. The important element in the majority decision, however, is that "all relevant circumstances" must be considered, and important among these is "reproduction cost on the basis of present prices," which must not be neglected. This latest decision is another encouraging pronouncement in the long string of Supreme Court findings which uphold the rewards of private initiative and guard against confiscation.

### Again the Question "How Do You Find Business?"

IT IS not hard to think back just a few short years to the days when business men on every side were asking each other the question "How do you find business?" Then the country was just pulling out of the valley of depression into the cheerful prospect of returning prosperity. Each one sought to bolster up his returning confidence with the courage of his fellows. Now again comes the query—repeated on every side. But the reason is somewhat different today. Prosperity and expansion have rolled up a wondrous record of late, and men are asking each other if it will continue.

The matter lies surely in the hands of those who themselves are asking the question. Blinded with greed for still greater profits, capitalists, manufacturers and merchants in the post-war boom kept on raising prices until the people would endure no longer, and a buyers' strike and the disastrous slump in business followed. Whether this bit of history is to repeat itself will depend much on whether the American business man will remember the lesson that he learned so painfully and refrain from imposing on the public.

The prosperity of the electrical industry depends upon the prosperity of industry in general, and all prosperity naturally is the sum of the success of individuals. The responsibility for protecting general business against a setback similar to that of recent memory devolves upon business men, merchants and manufacturers as individuals. If they too long forget their duty to the public, crowd on the profits and force up prices, reaction will inevitably come. If they temper their zeal with caution and with prudence, there need be no disappointment. The central-station business is one in which no such danger or, indeed, opportunity of pyramided prices exists. But central-station men as well as other electrical men can exert a sobering influence and help strengthen public sentiment for moderation in profit making in every community.

### Wet-Flashover Tests Not Susceptible of Close Control

A GOOD many engineers who comment on the standard pin-type insulator ratings proposed by the American Institute of Electrical Engineers ask why dry-flashover voltages should be used as the basis and wet-flashover voltages ignored. The selection is based on the very practical fact that the wet-flashover test under any known test conditions is not susceptible of close enough control to make its use feasible for such a purpose. The area over which water must be distributed in making such a test is small, but experiments to determine the uniformity of distribution of moisture show that even in such a small area, with the best means of spraying that can be designed, the distribution is surprisingly bad. There seems to be little hope of devising a practical method of keeping this factor under better control. Another important reason for the decision is the resistance of the water used in the tests. Large quantities are required. As an economic proposition it is impracticable to use water that has been treated to bring it to a standard condition of resistance and to maintain it in that condition for an indefinite time. As a result of these two difficulties wet tests made under apparently identical conditions vary too widely to permit their use as a basis of rating.

The dry test has been proved capable of close control as to conditions and results. Consequently it was selected as the basis for pin-type insulator ratings. The wet-flashover test, however, has a very definite value as a design check test, and the committee has presented a proposed standard for consideration.

### Why Not Take a Hint from Nature?

THE fierce sleet storms which overwhelmed forests and overhead lines in some parts of the country a year and a half ago left a shaky feeling in the minds of system operators lest even worse trouble come upon them. The sleet question is a queer one, not easy to reduce to formulas. Sleet seems to flourish especially in the climate of the northern United States—it is almost unknown in continental Europe—and the vital problem for designers of lines, poles and towers is to find out how, if at all, designs can be modified to gain comparative immunity from failure while still keeping within the limits of practical expense.

It would be interesting to know how many transmission-line operators have taken full cognizance of what happened to trees. The story of their destruction and successful defense ought to bring home a lesson to those who are building artificial structures to meet the same kind of stresses. In the worst of the devastated area the appalling combined effect of sleet and wind was evident everywhere. Big oaks and hickories snapped like pipestems under the load and branches were ripped off from the treetops down; maples and elms and other supposedly sturdy trees went to wreck at a moment's notice. But with it all the conifers escaped material damage. Thick though their foliage was, carrying the load of tons of ice, these great trees, engineered by nature on the principle of flexibility rather than stiffness, simply folded up their overburdened branches like the ribs of an umbrella and waited for the thaw to come. Then they shook off their icy burden and returned substantially unharmed to their original straightness and dignity.

Could something of this lesson be more often applied to overhead lines, particularly those which do not have outrageously severe loads of copper to carry? A little thought and study of how to obtain the maximum of elastic strength rather than the maximum stiffness would go far toward making a line of greater utility, although perhaps less attractive to the eye than many of the forms now in use. It is, after all, merely a matter of distributing the load so that it shall in a measure equalize itself before disaster comes.

### Power-Factor Correction a Commercial Problem

IT TOOK considerable time to convince central-station executives that a power factor meant decreased ability to serve and increased cost of operation. The growth of systems and the increased demands for power, however, presented specific facts that were sufficient to prove the case. For example, when voltage drop determines line loading and a specific line can carry double the load at unity power factor that it can at 70 per cent power factor, this fact becomes important financially if corrective equipment can be used more cheaply than duplicate circuits can be built. Thus an array of facts and figures proved to central-station executives that a low power factor makes overhead costs higher, increases production costs, limits the return from existing installations and reduces the general efficiency of the service.

Once convinced of the economic advantages of a good power factor, the executives called in the operating and commercial departments and ordered them to improve the power factor on the system. Easily said and easily analyzed on a theoretical basis, but difficult to accomplish commercially. Rate clauses containing penalty or bonus features, some ill-judged selling of corrective equipment to customers, new metering devices and accounting methods were some of the steps taken. But the fundamental thought was not emphasized that the customer must be "sold" on the benefits *he* would derive from power-factor improvement, and the results on the whole were not very satisfactory. Only recently has some new thinking been done to obtain real results with power-factor correction.

In the first place, the attention of the customer must be taken from power-factor rate clauses and focused on the real advantages of power-factor correction which will result in financial saving for his installation. In the second place, a thorough study and analysis of every proposed installation must be made to gather data on motors, circuits, operating requirements and energy consumption. Frequently these data will permit of rearrangement of the motors or rewiring to an extent that will be very beneficial both from an operating and an improved power-factor standpoint. In all cases the data are needed to show the decrease in circuit losses, the increase in motor efficiencies and the greater reliability of production and greater speed that can be obtained with a higher power factor. Once these items are capitalized to the customer in dollars and cents, he is willing to go further in considering power-factor corrective devices. Then the problem is to use the proper corrective equipment and the proper rate clause to obtain the results desired both by the central station and the customer. This problem is becoming increasingly less difficult because of the developments occurring in the industry. Thus power-factor correction is best obtained by properly "selling" the customers and by

getting away from the tradition long held by both manufacturers and central stations that a low power factor is inherent in the alternating-current system.

### Liberal as Well as Technical Training

DISCUSSION as to the most advantageous forms of educational training for the profession of engineering has for a long time indicated a realization on the part of educators, engineers and industrial employers that for many types of engineering problems far more is requisite in the way of formal training than is possible in the usual four years' undergraduate course. The additional needs are twofold, one in the direction of a wider general education, fitting for prominent participation in the economic and political phases of engineering discussion, and the other for more extensive training in special engineering fields, with a knowledge of pure science fitting for experimental research.

In response, first thought and suggestion have indicated the addition of the graduate school to the usual undergraduate curriculum. Several of the more prominent schools have for a long time announced and conducted graduate courses leading to advanced degrees. Apparently, however, attendance in these graduate courses has not been large, and it appears difficult to induce the four years' undergraduate to go on. In spite of scholarships and fellowships of steadily increasing value, the call of the industrial field, with a good living wage at the start, is more attractive than the prospect of two or three years more of intensive mental effort and, usually, rigid personal economy. Another reason, it is to be feared, is the lack of vision and inspiration of the average teacher of engineering subjects. Too often he is himself a four-year man, and his conception of the sphere of the engineer is limited to the normal processes of operation, routine design and industrial production. He is often incapable of holding up to the student the wide opportunities open to the engineer as a participant and agent in the large enterprises of social, civic and political life, as well as in the great field of engineering research. Apparently, the young man entering the usual four years' course somehow acquires at an early stage an idea that the highest aim and greatest rewards of the profession are open to him when he takes the bachelor's degree and receives an invitation to a beginner's job from a manufacturer's scout.

This is not to say that any large proportion of these four-year men should be encouraged to go further in formal training. The industries need them by the thousand each year, and not many of them are fitted for the advanced field. But a select few, and more than at present, should advance through the discipline of graduate study to the rank of the highly educated man, as well as that of the thoroughly trained engineer. Or, equally desirable, the prospective student of engineering should first take the liberal courses leading to the degree of bachelor of arts and then begin his professional studies. Some years ago Harvard adopted this plan for all students of engineering, but abandoned it after a few years; the plan was well conceived but too long a step in advance. For several years Columbia has been trying an intermediate plan in requiring two years of general college work for admission to her three-year courses in engineering, and the experiment is being watched with interest. A somewhat different method is found in the recent announcement by Johns Hopkins of combined courses in the liberal arts and engineering, in which certain fundamental courses necessary for engineering, such as applied mechanics and the like, are accepted as electives for the degree in arts and the combined time for both degrees, in the arts and in engineering, is shortened to five or six years. This type, of course, has been available for several years in a few Middle Western schools, yet only a few young men availed themselves of the opportunity offered. The plan seems to have the advantage of an easy transfer to the study of engineering, without wasted effort, by a student who is well advanced in courses in the liberal arts, and so has more of the desirable broad and fundamental education. These steps are indications that a few individual institutions are convinced of the importance of more liberal training for certain types of engineers and are willing to make the effort to train them. Perhaps only a few such courses are needed.

### Inspectors May Take Advantage of 1923 Code Changes

IT SEEMS unfortunate if, for a simple matter of expediency, the benefits of the recent revisions of the National Electrical Code are to be officially withheld from the public for several months. As pointed out in the ELECTRICAL WORLD in its issue of May 5, there are many reasons why the changes in the code should be made available for application at the earliest possible moment. They were worked out after long and thorough consideration and represent an advance in the code of no small importance and value.

It is, of course, easy to understand that the rearrangement and rephrasing of the code on account of the changes involved is not a small matter and is necessarily a somewhat slow process; but if the previous practice of the electrical committee is followed in this case, namely, to discourage the application of code changes until the revised edition can be printed, a delay of some consequence is involved. Some of the revisions are less restricted, some are more restricted, but all are in the public interest, and those who are building should have the advantage of the changes while building is going on.

It should be understood, however, that the actual final authority to place the changes into effect rests with the inspectors of the various districts. The code and its changes are essentially recommendations. The committee feels that it would exceed its authority if it sent out advance digests of the changes in the code, but its chairman, Dana Pierce, suggests that the ELECTRICAL WORLD reprint its statement of the code changes originally printed in the March 24 issue and furnish it to all inspectors who may desire copies. Such inspectors would then be in a position to use their admitted right to apply the new code.

Under the circumstances this seems an advisable move to make, and the ELECTRICAL WORLD will be glad to send without charge to any inspection authority who may desire them copies of the condensed statement of the 1923 code changes approved by Mr. Pierce at the time it was published as giving in essence the principal alterations. This at least provides a means for inspectors to have the code changes available now and to put them into practice in their districts at their discretion.

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**The Metropolitan District of New York, Showing the Financial Center of the World and New York Harbor**

# Character of Metropolitan Service

## Enormous Output of Electrical Energy in the New York District and Precautions Taken to Safeguard the Supply—Cities and Industries Depend on Central-Station Service—Tremendous Loads Thrown on System Suddenly

THE metropolitan district of New York includes not only the area within the corporate limits of the central city but also parts of the surrounding territory which are closely associated with the development of the metropolis. The city itself has an area of 183,555 acres and a population of 5,620,000, or 5.31 per cent of the entire population of the United States. Outside and within the metropolitan area are the counties of Nassau and Westchester in New York and the counties of Bergen, Essex, Hudson, Middlesex and Union in New Jersey. These have a combined population of approximately 2,500,000, giving to the metropolitan district almost 8 per cent of the entire population of the country. This district ranks first among the metropolitan districts of the United States in the value of its products.

The quantity of electricity generated in the New York district for all purposes in 1922 was fully six thousand million kilowatt-hours, with a peak load of approximately 1,500,000 kw. and a load factor hovering around 40 per cent. Of this amount the isolated plants in the hotels and some of the office buildings of New York City and those in the large industrial districts of New Jersey contribute over a thousand million kilowatt-hours yearly. The outputs and peaks of the public utility companies in 1922 are shown in Table I, in which no account has been taken of the outputs of the smaller generating companies in the boroughs of Richmond, Brooklyn and Queens or in the New Jersey districts.

TABLE I—OUTPUTS AND PEAKS OF METROPOLITAN UTILITY COMPANIES

| Name of Utility Company | Output in Kw.-hr. | Peak Load in Kw. |
|---|---|---|
| New York Edison Co. and United Electric Light & Power Co. | 1,659,269,781 | 497,577 |
| Public Service Electric Co. | 958,407,194 | 249,778 |
| Brooklyn Edison Co. | 516,987,870 | 164,495 |
| New York & Queens Electric Light & Power Co. | 120,011,093 | 35,300 |
| Interborough Rapid Transit Co. | 886,223,920 | 246,770 |
| Brooklyn Rapid Transit Co. | 413,992,125 | 118,800 |
| Pennsylvania Railroad Co. | 214,906,725 | 72,000 |
| New York Central Railroad Co. | 157,450,819 | 48,470 |

### LEADING INDUSTRIES OF NEW YORK

While it is universally known that New York is the largest city in the Western Hemisphere, it is not generally appreciated that its population is almost as large as that of the State of Ohio, the fourth most populous state in the Union. Brooklyn, for instance, has a larger population than the city of Philadelphia; Manhattan and Queens exceed Chicago by 40,000; the Bronx is as big as Baltimore, and Richmond is more populous than Nashville or Salt Lake City.

Industrially the city also leads. The essential facts concerning New York's manufacturing industries are shown in Table II.

New York leads the country in the production of many items in common use and manufactures a very large proportion of many others. This is particularly true of outfitting and apparel. For the women who make their own clothes, for instance, New York produces 95 per cent of all the paper patterns made in this country, and for the women who wear ready-made clothes New York produces nearly three-quarters of the country's entire output. The same is true of fur goods. New York also makes about one-half of the country's output of millinery and lace goods. In the city are cut and polished 90 per cent of the diamonds and other precious stones which are manufactured in this country. One-third of the country's jewelry is manufactured in New York and about 30 per cent of the nation's production of pianos.

For men New York makes four out of every ten ready-made suits of clothes, 46 per cent of furnishing goods, 40 per cent of the shirts and a quarter of the hats. It also supplies them with four out of every five tobacco pipes made in the country. New York is the greatest printing and publishing center of the country. It makes 29 per cent of the toys and games, a third of the mirrors, a quarter of the buttons, chewing gum and scientific instruments, and a large percentage of the patent medicines and compounds manufactured in the United States. In addition to all these is the fact that New York is now the financial center of the world.

### PROBLEM TO FIND SPACE FOR WIRES

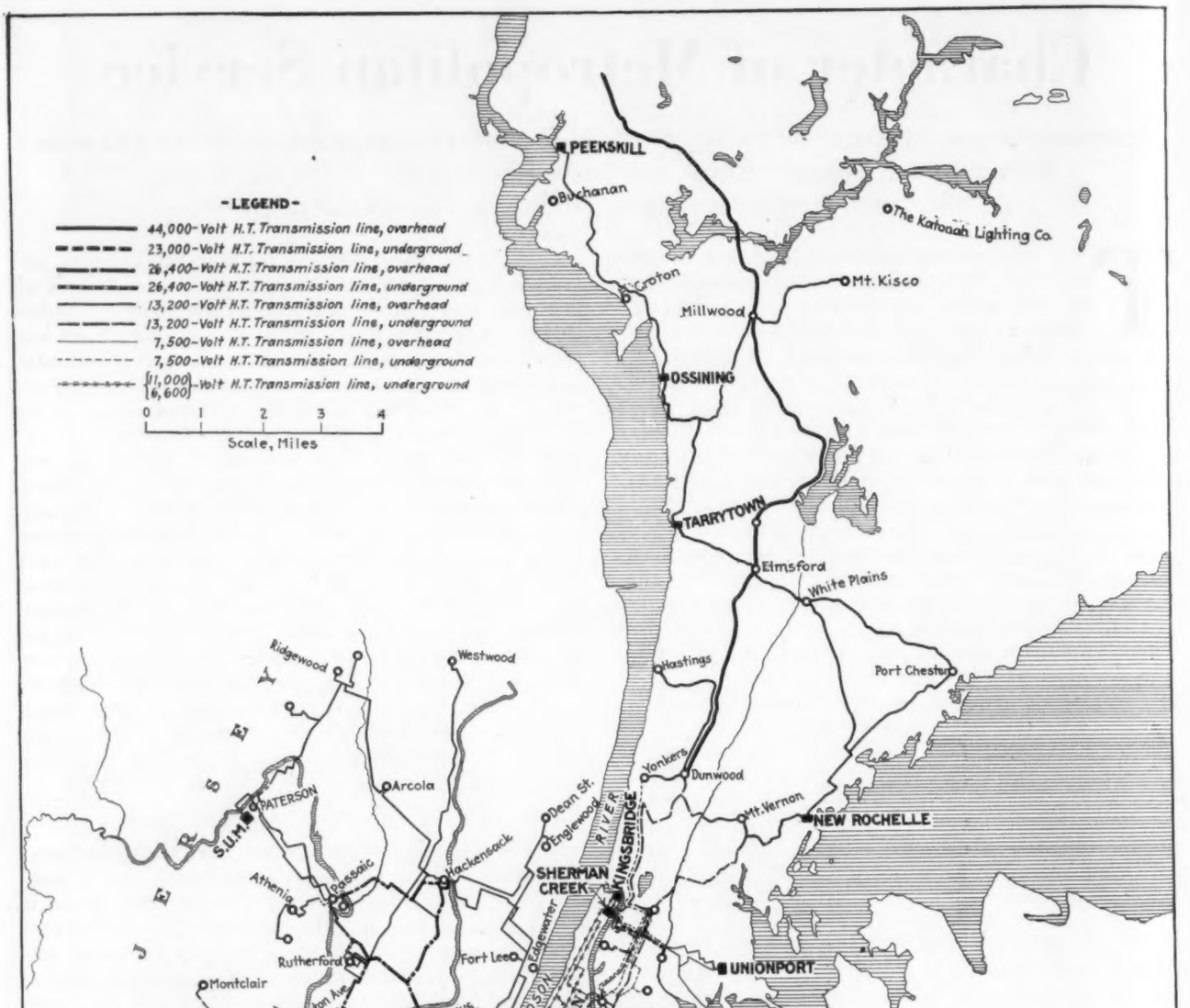
In a district the size of New York, with so many diversified and varied industries and with such a compact population working in skyscrapers and living in huge apartment houses, naturally electricity plays a very important part, more important than in any other city in the world. Without it the immense subway system of passenger transportation would be impossible, skyscrapers and large apartment houses and hotels would be largely uninhabitable, Broadway would become a village street, and a large part of industry would have to move elsewhere.

Having such a vital part in the life of the city, every precaution is taken to safeguard the supply of electricity and to provide for continuity of service. No overhead wires are permitted in the Borough of Manhattan, so that distribution of all electric service there is underground. So intensive is the use of electricity in many of the districts of Manhattan and so occupied are the streets with subways, pipes and ducts that the limit of capacity of many of the substations is fixed by the space available for underground cables in the streets. In the congested districts the situation is causing the operating companies much concern.

TABLE II—MANUFACTURING DATA FOR NEW YORK CITY

| | |
|---|---|
| Number of establishments | 32,590 |
| Persons engaged in manufacturing industries | 825,056 |
| Capital | $3,038,557,492 |
| Salaries and wages | 1,131,994,192 |
| Value of products | 5,260,707,577 |
| Value of raw material used in manufacture | 2,801,619,388 |
| Value added by manufacture | 2,399,231,459 |

All of the generating stations in New York are interconnected, and the practice in Manhattan is to feed the substations from independent generating sources. More equipment could be installed in the generating stations of The New York Edison Company if sufficient space




**Generating Stations and Substations in New York Metropolitan District**

could be found in the streets for the copper feeders. As it is, lack of street space has limited the interconnections between generating stations and between generating stations and substations even though the distribution voltage has been raised from 6,600 to 11,000 and tie feeders between stations are being operated at 40,000 volts.

### IMPORTANCE OF ELECTRIC SERVICE

The reasons why continuous electric service is imperative in the Borough of Manhattan will be apparent from the following considerations: The high-pressure pumping stations of the fire-protection system are absolutely dependent on central-station service for their operation not only in the Borough of Manhattan but in the Borough of Brooklyn as well. Any interruption lasting over three minutes is penalized at the rate of $400 a minute, but no penalty has so far been collected in either borough. The police and fire-alarm signaling systems, the ticker system, the telephone and telegraph systems of the Bell, Western Union and Postal companies, the trans-Atlantic cable companies, the newspapers, the garment and needle trades, 95 per cent of the passenger and freight elevators of the borough and the entire street-lighting system depend solely on the electric service of The New York Edison Company.

In order to provide a service which shall be at all times available great precautions must be taken. Coal shortage because of strikes or other reasons is guarded against by storage at Shadyside, N. J., and at the Hell Gate station, in addition to the overhead bunkers in the generating stations themselves in the case of the New York Edison and United companies. Space is available for more than 300,000 tons of coal, and during the recent coal crisis large cargoes of coal were imported from England. Taking into consideration the cost of the real estate and equipment and the cost of the coal in storage, the amount of working capital tied up in coal storage alone is not far short of $5,000,000 for the Edison company. In addition, to guard against any emergency or failure of generating equipment The New York Edison Company has electric storage batteries whose one-hour discharge rate is 471,000 amp. and from which 250,000 kw. can be pumped into the system for fifteen minutes.

The downtown section of New York is built skyward. There structures unequaled in height in any other section of the world are built wall to wall as compactly as possible. Each is a city in itself, with its vertical traction system in the shape of elevators, with a complete water supply and sewerage system and with power and lighting loads exceeding those furnished by many towns of like population. So high are these buildings that the streets resemble canyons more than thoroughfares, and electricity must be used for lighting the lower offices even during the day.

Such a condition is not without its effect on the electric light and power company, particularly when sudden storms sweep over the city. Every precaution is taken to have the power houses ready for such emergencies, and warnings are telephoned to operators when lowering clouds appear. The peaks thrown on the system are oftentimes of short duration, but to meet them means eternal vigilance and tremendous cost.

One such peak occurred at 4 p.m. on March 2, 1911, when an extra 52,000 kw. came on the system, which in five minutes was carrying a load of 75,000 kw., the extra load disappearing during the following ten minutes. The cause was a snow squall from the Northwest. On June 20, 1919, about 3 p.m., when the system was carrying 180,000 kw., a thunderstorm added 133,000 kw. to the load in about thirty minutes, and this extra load did not entirely disappear until 5 p.m. The total load overtopped the winter peak by 15,000 kw. In this case about 40,000 kw. was carried by the storage batteries for a few minutes. Similar in its effects to the thunderstorm peak, but not so troublesome, is the dark day. On Feb. 28, 1923, the load on the system increased from 120,000 kw. to 435,000 kw. in two and one-half hours, an increase of nearly 3,000 kw. per minute, and this load persisted for more than eight hours. One can readily appreciate the great reserve capacity required in an electric supply system capable of handling such tremendous loads on such short notice without any indication of distress.

### MORE THAN A MILLION METERS INSTALLED IN CITY

The practice of selling electricity in New York differs somewhat from that which obtains in other cities in that dwellers in huge apartment houses are customers of the landlord rather than customers of the company. Thus the number of meters actually owned and installed by the utility companies represents less than the total number of users of electric service. There are in the Borough of Manhattan alone more than 150,000 sub-meters in apartment houses, service to which is supplied by the public utilities through a master meter.

The total number of meters connected to the circuits of the utility companies in the greater city was, at the end of March, 889,946, which, plus the sub-meters installed in apartment houses, brings the total number of electric meters in use to considerably over one million. As all of the distribution circuits on Manhattan are underground, and underground construction on Manhattan means blasting from solid rock, it will be appreciated that the cost of servicing a customer is high. Notwithstanding this fact, there is no minimum service charge for energy in Manhattan and the Bronx, and The New York Edison Company has on its circuits more than 50,000 customers whose annual bills for electrical energy are less than $10 a year.

The number of new meters which are being added to the circuits of the companies in Brooklyn, Queens and in the New Jersey district is very great. The Public Service Electric Company of New Jersey, for instance, connected 63,901 meters to its system last year, as compared with 45,912 in 1921, and of these 83 per cent were small meters for domestic service. The Brooklyn Edison Company in a smaller district during the same period added 63,657 new meters, a gain of 26 per cent over 1921. The ratio of growth in the Borough of Queens is even larger, the New York and Queens Electric Light & Power Company, which has almost 100,000 meters on its circuits, having increased their number during the last ten years 1,400 per cent.

### EXPENDITURES FOR EXTENSIONS AND ADDITIONS

Of course, enormous expenditures have been made and are being made by the electric public utility companies to keep abreast of the demands made upon them for service. Since 1916 The New York Edison Company and its subsidiary, The United Electric Light & Power Company, have expended more than $70,000,000 for additions and betterments to the system. This company, which has the largest gross income of all of the purely electric light and power companies of the country, will, at the present ratio of increase, which is

over 16 per cent, have a gross income of more than $60,000,000 this year. The Brooklyn Edison Company has increased its gross revenue in five years 135 per cent, and the gross earnings of the company for the four months ended April 30, 1923, showed an increase of $2,000,000 over the same period last year, or an annual rate of increase of $8,000 000. The gross earnings last year amounted to $19,129,000 against $16,000,000 in 1921. Since 1921 the capital of the company has been increased from $19,000,000 to $50,000,000.

The large increase in business reflects the fact that new construction in Brooklyn is going ahead at a pace equaled by few cities in the United States. During the first four months of the year the Brooklyn Edison Company added 22,000 new customers, and May showed no diminution in the rate at which new names were being added to the books. At the first of this year the expansion program of the Brooklyn Edison Company, to meet increasing demands for service, called for an expenditure of about $15,000,000, while $7,000,000 had been expended out of earnings for this purpose during the previous year. The expansion program includes a new 400,000-kw. steam station on the East River at Hudson Avenue. This station when completed will be one of the largest in the country.

Other features of the generating systems in the metropolitan district are given elsewhere in this issue.

# Edison and United Companies' System

## Manhattan Island Has the Most Concentrated Load of Diversified Character to Be Found in the United States—Service in the Bronx and Westchester and Connections with Railroads and with Brooklyn

By JOHN W. LIEB
*Vice-President The New York Edison Company*

THE starting of the historic Pearl Street station on Sept. 4, 1882, initiated the service of The New York Edison Company, as well as central-station electric service in the world as it is thought of today. Contemporary scientists predicted the failure of the undertaking, designating it as an absolute "ignis fatuus," but it proved to be a forerunner and established the basis of the highest type of central-station supply as it is now known. In the short period since the starting of the old Pearl Street station in New York the tremendous accomplishments of The New York Edison Company and The United Electric Light & Power Company have been recorded.

The territory directly served by these companies covers Manhattan and, together with its affiliated distributing company, the Borough of the Bronx. The electrical energy required in the city of Yonkers, served through the Yonkers Electric Light & Power Company, is also provided from the generating stations of the companies, as is a part of the energy required in the Borough of Queens and in Westchester County, which are served through allied companies, the New York & Queens Electric Light & Power Company and the Westchester Lighting Company. Thus the energy generated by the allied companies serves a territory extending from the southern tip of Manhattan Island to the Putnam County line, a distance of about 50 miles, and includes Yonkers, Westchester County and the Boroughs of Manhattan, Bronx and Queens as shown on the map of the metropolitan district.

The area of the territory served directly by The New York Edison Company and The United Electric Light & Power Company is approximately 40 square miles, with about 3,000,000 inhabitants, while the corresponding figures for the entire territory referred to are 550 square miles and about 3,800,000 inhabitants.

### Five Generating Stations

The generating stations of the two companies comprise five stations of a total rated capacity of 635,000 kw., of which 405,700 kw. is 25-cycle alternating-current and 221,500 kw. is 60-cycle, with 7,800 kw. of direct-current generation. In order to care for the load of the coming winter there will be added a 35,000-kw., 25-cycle turbo-generator, making the total capacity of the stations 670,000 kw. Including the stations of the Third Avenue Railroad and the Hudson and Manhattan Railroad, which are operated by the companies under lease and are rated at 60,000 kw., there is in 1923 a total generating capacity, operated as a unit under the combined auspices, of 730,000 kw.

Waterside generating stations Nos. 1 and 2 are adjacent to each other on the East River between Thirty-eighth and Fortieth Streets. Waterside No. 1 commenced operation with large engine generator units, which have all been replaced by steam-turbine generator units, and it now has a total installation of ten units with an aggregate capacity of 174,000 kw. Two of the units are of 35,000 kw. capacity each, and all of them are 25-cycle except two small 60-cycle units aggregating 16,500 kw. The generating equipment of Waterside No. 2 comprises ten steam-turbine generator units of an aggregate capacity of 152,200 kw., of which all are 25-cycle except one 60-cycle unit of 14,000 kw. capacity. The Sherman Creek generating station of the United company, in Manhattan on the Harlem River at Two Hundred and First Street, contains eight steam-turbine generator units with an aggregate capacity of 151,000 kw., of which 40,000 kw. is 25-cycle and the remainder is 60-cycle. The Hell Gate generating station of the United company, on Long Island Sound at the foot of One Hundred and Thirty-fourth Street in the Bronx, with an ultimate capacity of 300,000 kw., has now installed two 35,000-kw., 25-cycle steam-turbine generators and two 40,000-kw., 60-cycle units. The original Duane Street generating station of 7,800 kw. capacity supplies direct current feeding into the Edison network in the business district near the southern end of Manhattan.

The Hell Gate generating station receives most of its coal from oceangoing ships and is equipped to unload such boats rapidly. Thus, during the recent extreme

shortage of coal, coal-laden boats from England went directly to the Hell Gate dock for unloading. This station is also equipped to receive coal by rail as well as by water. The other generating stations receive their coal by barge, the coal being brought to New York tidewater by rail, supplemented by the supply for the Shadyside storage yard.

The fuel supply for the generating stations is fortified by the large Shadyside coal storage yard, with a capacity of 240,000 tons, on the west bank of the Hudson River opposite Ninety-sixth Street, local storage capacity at the Hell Gate Station amounting to 60,000 tons, a total of 300,000 tons exclusive of the coal in process of utilization in the bunkers over the boilers of the several generating stations. In addition to this adequate provision for emergencies, the companies further participate in the storage facilities provided at the Consolidated Gas Company's plant at Astoria, with a capacity of 700,000 tons, located immediately opposite the Hell Gate station.

All of the generating stations are interconnected by tie cables of sufficient capacity to supply the loss in emergency of the largest unit in any station. Ties are also maintained through all substations to provide for the loss of at least one transmission cable.

The load dispatching of the entire system is supervised and directed by a system operator at the Waterside station. The system operator's room is equipped with a pilot board automatically indicating the position of all switches in all generating stations and all switches controlling high-tension feeders to substations and customers. A special telephone switchboard is installed with direct lines to all substations and generating stations and with trunks to several telephone exchanges. A Gamewell fire-alarm system is also provided for simultaneous instantaneous signaling between all substations and generating stations. All city fire alarms from the district supplied by the high-pressure pumping stations are also recorded at the system operator's room, and storm warnings are received by a "wireless detector."

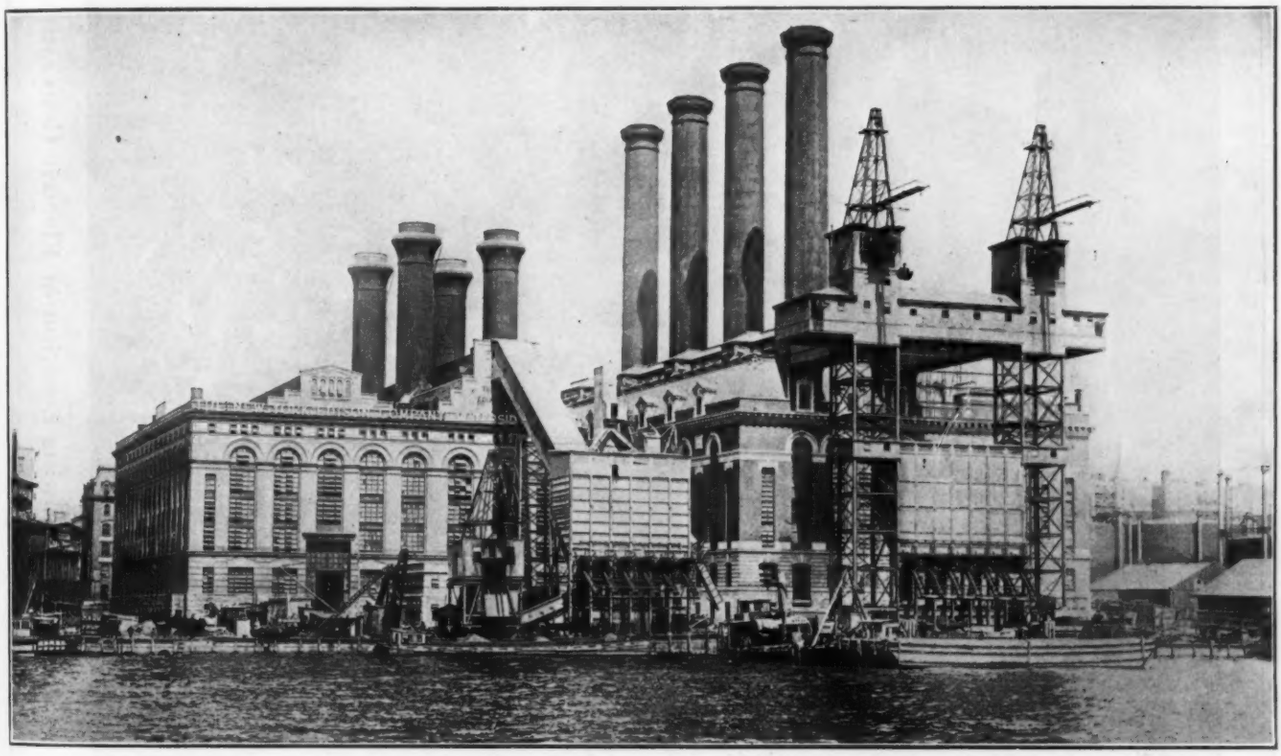
The total demand on the Edison and United generating stations in 1922 was 525,000 kw., and the total output for that year was 1,665,000,000 kw.-hr.

It is interesting to note that in Manhattan sudden thunderstorms are sometimes accompanied by inky darkness, causing the midsummer load to rise to an amount almost equal to the previous winter's maximum. Thus the spare peak capacity usually found in central stations during the summer months is not available, a condition singular to Manhattan Island.

Energy is supplied to 25-cycle substations over radial feeders at 6,600 and 11,000 volts and to 60-cycle substations through parallel feeders at 7,800 and 13,200 volts. All transmission feeders operated by the Edison and United companies are carried underground. The supply to the Westchester Lighting Company is through two 45,000-volt underground feeders at 60 cycles (six single-conductor cables) from the Sherman Creek generating station to the New Rochelle substation, at which this energy is transformed to 13,200 volts for supply to other substations.

The northern end of Westchester County is also supplied from the Dunwoodie Avenue substation of the Yonkers Electric Light & Power Company via 45,000-volt overhead lines to the Elmsford substation. The New York, New Haven & Hartford Railroad Company is supplied by three-conductor, 25,000-volt underground cables at 25 cycles which tie in with the railroad's generating station at Cos Cob.

Tie connections for interchange of power are also maintained with the Interborough Rapid Transit Company at 11,000 volts, 25 cycles; with the Pennsylvania Railroad at the same voltage and frequency through the Jersey City Station of the Hudson & Manhattan Company; with the Brooklyn Rapid Transit Company at



WATERSIDE STATION OF THE NEW YORK EDISON COMPANY

**Aerial Photograph of New York, Showing Location of Electric Generating Stations**

6,600 volts, 25 cycles, and with the Brooklyn Edison Company at the same voltage and frequency and also at 13,200 volts, 60 cycles. The last-named connection is now being changed to operate at 26,000 volts.

High-tension energy is supplied in bulk to certain large customers, such as ice manufacturing companies, mostly at 7,800 volts or 13,200 volts, 60 cycles, through single or multiple loop feeders, with automatic switches in the customers' premises. This service is in all cases stepped down to not more than 440 volts by the customers' transformers. In the case of the pumping stations for supplying high-pressure water for city fire protection the energy is fed at 6,600 volts, 25 cycles, with two direct feeders from separate generating stations and two feeders from separate substations to each pumping station, the pump motors being operated direct at the 6,600-volt feeder pressure. This service, as will be appreciated, is of a highly important character, supplying water through a separate system of mains to the fire hydrants in the business sections of the city. It may be interesting to note that a very definite penalty clause for failure to supply energy is included in the contract.

### MANHATTAN'S THIRTY-TWO SUBSTATIONS

The thirty-two substations serving the direct-current network in Manhattan have a total capacity of 380,000 kw. in 185 25-cycle synchronous converters, of which the largest units are of 4,200 kw. normal capacity. The conversion equipment is supplemented by storage batteries capable of supplying a discharge of 60,000 kw. for one hour. The output of these substations is distributed over 1,600 feeders connected to a network of 810 miles of service mains.

Part of this same territory is also served by 60-cycle low-tension distribution. This, together with the portion of Manhattan north of One Hundred and Thirty-sixth Street and the Bronx west of the Bronx River, is supplied by ten substations of a total capacity of 140,000 kva., the transformers used being mostly in sizes of 2,000 kva. and 3,000 kva. The 60-cycle distribution in Manhattan is at 3,000 volts, two-phase, three-wire, lighting being supplied across the outside legs. In the service fed from one substation this has now been changed to three-phase service and a low-voltage interconnected network has been put into service. In the Bronx the distribution is at 2,300 volts, two-phase, four-wire.

The system in Queens Borough, supplied by the six substations of the New York & Queens Electric Light & Power Company, with a total capacity of 90,000 kva., utilizes 2,300-4,000-volt, three-phase, four-wire distribution circuits, the high-tension feeders operating at 7,800 and 13,200 volts. Westchester County is served through thirteen substations of the Westchester Lighting Company, with a total capacity of 50,000 kva., the transmission voltage between substations being 13,200 and the distribution at 2,300 volts, two-phase. The city of Yonkers is supplied from the two substations of the Yonkers Electric Light & Power Company, the total capacity in step-down transformers being 15,000 kva., the transmission between stations at 13,200 volts and the distribution at 2,300/4,000 volts, six-phase, four-wire. The distribution from that portion of the Bronx east of the Bronx River is supplied from the Bronx Gas & Electric Company's substation at 2,300 volts, two-phase.

The foregoing can be considered a brief outline of the generating, transmission and substation features of the system of The New York Edison Company, The United Electric Light & Power Company and associated companies in the Bronx, Queens and Westchester Counties.

The districts other than Manhattan are largely similar to cities of the same population in the character of their load, composed of residential, business and power consumers. The load in Manhattan Island, however, an area of 21 square miles, represents the most concentrated diversified central-station load in the world, both from a standpoint of the population served (an average of 114,700 per square mile) and the density of the load itself.

As a result of the concentration of load and the restricted area the physical conditions affecting the distribution systems are peculiar. The load continues to increase year by year at a more or less uniform rate of from 12 to 15 per cent, and this means a continuing growth within a fixed area without reaching saturation.

The factors of building and population which cause the increase in central-station load carry with them also an increase in all other facilities such as transit, gas, water and steam, producing a progressive congestion of physical equipment within the fixed boundaries of the streets that makes the problem of construction of substations and installation and maintenance of distribution systems increasingly difficult because of space limitations and restrictions due to subsurface structures.

Coupled with the enormous concentration of load is the character of the load itself, which requires adequate and uninterrupted service at all times to newspapers, ticker service, telephone, telegraph and other wire communication systems, city lighting, fire service, hospitals, office buildings of great magnitude where the electric elevator service represents vertical transit facilities to innumerable tenants, and similar important service. The company-owned meters total in Manhattan Island alone approximately 350,000, to which should be added many thousands of customer-owned meters in individual buildings.

### STREET LIGHTING SYSTEM

It may be of interest to add a word relative to the carefully planned street lighting throughout the city. The companies referred to supply approximately 50,000 street lamps of the multiple and series types of the high-efficiency "type C" form of Mazda incandescent lamp. The outstanding feature of the planning of the street lighting is the zoning of the districts and the allocation of lamps from 100-cp. size for suburban districts to the twin form of post carrying two 500-watt lamps for districts comparable with Fifth Avenue, Times Square, etc.

The lamp posts are of an ornamental type designed for the particular districts both as to height and form and are of types suitable for the residential districts, the business sections and the boulevards, parks and more highly developed avenues. The wide variation in the size of the "type C" incandescent lamp from 100 cp. to 750 watts enables application of illumination intensities, and, in combination with the proper post design, provides for a standardized equipment suitable for any desired street illumination.

From this brief summary a conception may be had of the conditions under which current is generated and distributed from the generating stations and substations on Manhattan Island and in the Bronx and the territories adjacent thereto served by the distributing systems of the companies allied with the Edison-United companies and from the standpoint of generation of current operated as a unified system.

# Alternating Current in New York

## Growth of Business Has Necessitated Additions to the Hell Gate Station of the United Electric Light & Power Company— Interesting Features of New Equipment

By FRANK W. SMITH
*Vice-President and General Manager The United Electric Light & Power Company*

FROM its Hell Gate generating station and its Sherman Creek station The United Electric Light & Power Company supplies electricity both to its allied companies and to the 82,150 customers on its lines. Because of the first class of service the United company may perhaps be considered in the nature of a "superpower company." Apropos of the second, it is interesting to note that of the total 82,150 customers supplied with United service on April 30 of this year 56,277 represent those residing in the Washington Heights section—that territory in Manhattan north of One Hundred and Thirty-fifth Street, which is exclusively supplied by the United company. Electric light and power facilities were first introduced in this district on Dec. 26, 1899. The remarkable strides taken in less than a quarter of a century are apparent in the fact that nearly four-fifths of the company's business is established in this new field.

The Hell Gate station was constructed for an ultimate capacity of 300,000 kw., and at the present writing equipment to one-half of this amount has been put into operation. At the Sherman Creek station the total capacity of 150,000 kw. has been utilized for some time. During the month of April 40,000,000 kw.-hr. was generated at Hell Gate, and the maximum load was 103,500 kw. At Sherman Creek during the same month 33,500,000 kw.-hr. was generated, with a maximum load of 94,000 kw. In comparison with these figures the following data for January, 1923, may be of interest: Hell Gate, 40,700,000 kw.-hr., with a maximum load of 110,000 kw. Sherman Creek, 39,327,000 kw.-hr. with a maximum load of 103,300 kw.

### ADDITIONS TO HELL GATE STATION

A description of the new Hell Gate station appeared in the ELECTRICAL WORLD for April 29, 1922. In that issue the departures from conventional practice were accentuated and described in some detail.

Among the features which make Hell Gate station stand out as an unusual plant are the following: The turbine room is next to the river, with the boiler room between it and the electrical galleries; alternating-current-driven auxiliaries are used, with one or two exceptions; phase isolation of all electrical equipment has been carried out; the ashes are sluiced by hydraulic means; the station equipment has been divided into four independent groups, and heat-balance control is provided. The arrangement of condenser circulating-water intakes and discharge, the use of boilers with superheaters only six tubes above the combustion chamber, the extensive equipment of motor-operated valves, the truck-type switchboards for station service and the coal-handling facilities are also worthy of note.

Oceangoing coal boats may land directly alongside the station for unloading by means of the coal towers. In addition, a direct siding from the New York, New Haven & Hartford Railroad permits the receipt of coal by rail—a feature possessed by Hell Gate alone among the generating stations in New York. The existence of two independent routes for bringing coal to the plant is of tremendous value in view of the absolute continuity of service that must be maintained on the system. The Hell Gate site possesses a further safeguard in this respect in having an outside storage capacity of approximately 100,000 tons, which insures about four weeks' operation at the ultimate load in case all the other sources of coal supply are cut off.

When the Hell Gate generating station was constructed it was planned to add further sections of equipment as the demand would warrant. This policy has been adhered to from the start. In line with this three new sections of electrical galleries are being added this year to the four sections already installed. These three sections of electrical galleries occupy an area of, roughly, 105 ft. x 94 ft. and are seven stories high.

The same system of compartments will be employed in these sections, and the same method of installing the ducts with paper forms will also be used. As described in a previous issue of the ELECTRICAL WORLD, two of the first four sections of the electrical galleries were equipped for 25-cycle operation and two for 60-cycle. The three new sections will be equipped entirely for 60-cycle service, but two of the present 60-cycle sections will be reconnected for 25 cycles. The installation will then comprise four 25-cycle sections and three 60-cycle sections for the coming year. This reconnection does not involve any considerable expense as most of the apparatus is suitable for either frequency.

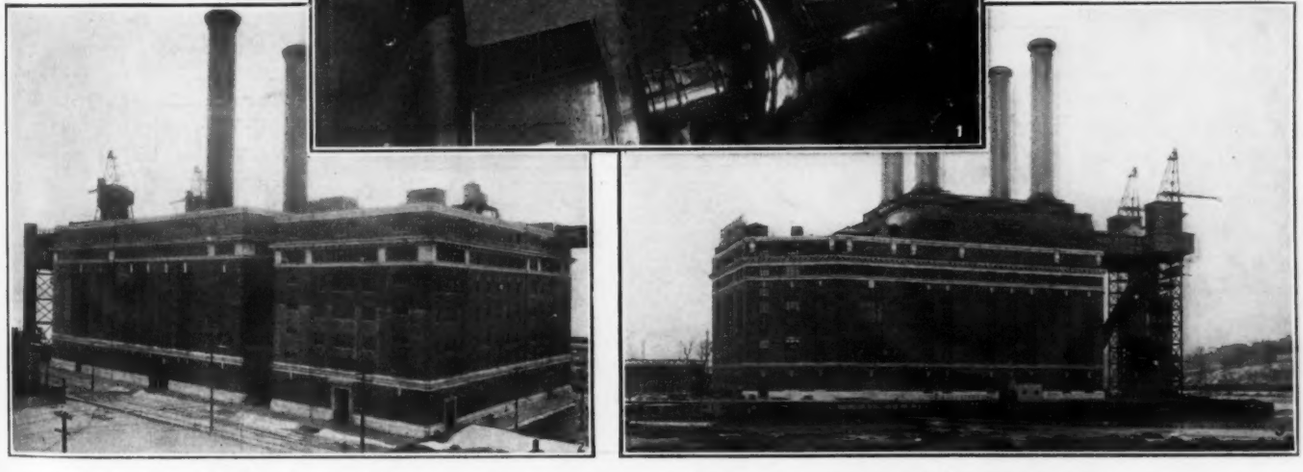
There have been purchased for the new sections ninety-nine Westinghouse circuit breakers of the same type and rupturing capacity—1,500,000 kva.—as was originally installed. These range in capacity from 3,000 amp. for the generators to 600 amp. for the feeders. The installation of this type of equipment in the present installation was an innovation, but the satisfactory service given made it advisable to continue the equipment along the same lines. In addition there have been purchased from the Metropolitan Device Corporation 120 porcelain-clad reactors of 3 per cent and 5 per cent reactance. This equipment also duplicates that installed originally.

### 50,000-KW. UNIT PURCHASED FOR 1924

For installation this year one General Electric 35,000-kw. turbine, similar in a general way to those now installed, has been bought. This turbine will exhaust into a Worthington condenser similar to that already in service. The circulating pumps, however, will be driven by two-speed motors instead of by the constant-speed motors used on all of the present circulating pumps.

A 50,000-kw. unit which is of especial interest has

been purchased from the Westinghouse Electric & Manufacturing Company for the 1924 installation. The turbine is to drive a 62,500-kva., 60-cycle, three-phase, 13,200-volt generator and will operate at 1,200 r.p.m. It is a single-cylinder unit, and in addition to the main generator it will be equipped with an auxiliary power generator of 2,000 kw., 2,500 kva., for auxiliary service at 60 cycles, three-phase, 2,400 volts. This auxiliary generator will be directly coupled to the main generator shaft, and a directly connected exciter will be on the end of the auxiliary generator shaft. The unit will have its best point of economy at 35,000 kw. and will have a peak-load capacity of 56,250 kw. A fairly flat performance curve between loads of 25,000 kw. and 56,250 kw. is guaranteed. The length of the entire unit with auxiliary generator and directly connected exciter will be approximately 77 ft. by about 22 ft. in width. This size permits the unit to fit nicely into the same space as is occupied by each of the present units. This unit represents the first 50,000-kw. single-cylinder unit which the Westinghouse company has contracted to make. Its design is of the impulse reaction type, consisting of one double Curtis wheel followed by the standard reaction intermediate blading and low-pressure blading of the so-called "Bauman" type, which permits the turbine to exhaust through one single-exhaust opening, there being three multiple passages through the Bauman blading to this single exhaust. It will be arranged for feed-water-heating purposes, the present plan being to provide for feed-water heating by four stage bleeding of the turbine, using the auxiliary generator to provide the necessary power incidental to the operation of the unit. It might also be noted that this is the first unit of this capacity to be equipped with a small generator on the main shaft for auxiliary power purposes. The present installation at Hell Gate consists of twelve 1,890-hp. Springfield boilers with no economizers but equipped with superheaters above the lower six rows of tubes. Under each boiler there are two fourteen-retort, seventeen-tuyère Taylor stokers discharging into a central ash pit. Although this installation is working satisfactorily, it was thought that further economies could be accomplished by a modification of it. Three new boilers have been purchased of the same general design but of 1,550 hp. each. Instead of being twenty tubes high they will be sixteen tubes high, with four rows instead of six below the drop leg. In addition to superheaters these boilers will be equipped with economizers. These are to be furnished by the Power Specialty Company. They are of the one-pass, counter-current design with elements 18 ft. long over rings and will have 13,824 sq.ft. of external heating surface. Each unit will be sixteen elements wide and four-



HELL GATE AND SHERMAN CREEK STATIONS, SHOWING INTERIOR OF SHERMAN CREEK STATION

teen rows high. The superheaters, instead of being placed in the original position, will be installed on the top of the first pass. Instead of a double stoker there will be a single fourteen-retort, thirty-three-tuyère Taylor stoker. These changes, of course, necessitate a different baffling arrangement.

The same method of disposing of ashes by a sluicing system will be maintained. On account of these boilers being fed from only one side it will not be necessary to purchase another coal lorry at this time.

An equipment of forced-draft and induced-draft fans similar to that of the original installation will be installed driven by B. T. S. General Electric motors. These motors have operated satisfactorily, and their purchase for this installation is economically sound.

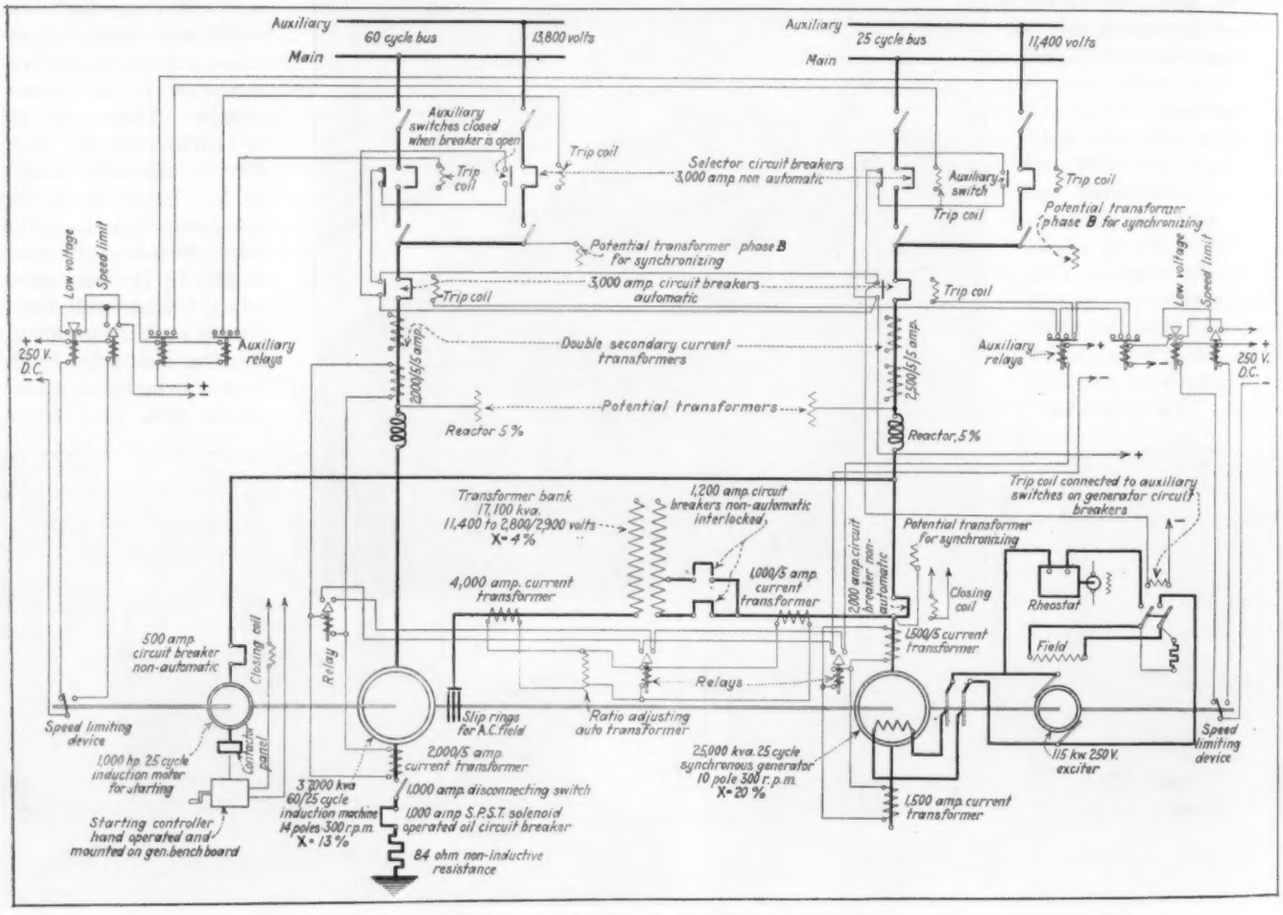
The present auxiliary power for the Hell Gate station is obtained from two banks of transformers fed from the main 60-cycle, 13,200-volt bus and stepping down to 2,300 volts, and from two 2,500-kva. turbo-generators generating at 2,300 volts. For the present year this will be sufficient. A further extension, however, is necessary to the truck switch installation. New switches have been purchased from the General Electric Company in sizes of 400, 1,200 and 2,000 amp.

An interesting addition to Hell Gate which is expected to be in operation during the coming fall is the installation of five 12,000-kva. oil-cooled outdoor-type transformers. These are the largest type of self-cooled transformers made. With their oil they weigh 42½ tons each, but in spite of this weight they will be shipped filled with oil to eliminate the drying out of coils after being received. They will be used to supply service to allied companies and will be installed at the extreme south end of the part of the property devoted to electrical galleries. They are delta-connected on the low-voltage side and star on the high and step up from 13,800 volts to 28,980 volts. They will have additional taps for approximate voltages of 27,600, 26,100, 24,700 and 23,000 for operation at full kilovolt-ampere capacity. They are of the core type with interleaved disk windings and will be equipped with conservators, ratio adjusters for the taps and temperature-indicating coils.

There will be installed for operation this year a 35,000-kw. induction synchronous-type frequency converter to be used for tying together the 25-cycle and the 60-cycle systems. Units of this type in large sizes have not previously been built, and its operation is looked forward to with interest. The set is to be furnished by the General Electric Company. It operates at 300 r.p.m. and consists of a 37,000-kva. wound-rotor induction motor having fourteen poles, a 13,800-volt, 60-cycle stator, and a 2,850-volt rotor wound for 25 cycles directly connected to a synchronous 25,000-kva., 25-cycle generator operating at 11,400 volts. On the same shaft are installed a six-pole, 115-kw., 250-volt exciter and a 1,600-hp., 11,400-volt, three-phase, 25-cycle starting motor. Between the slip rings of the main induction machine and the high-voltage 25-cycle bus is a 25-cycle, 17,100-kva. transformer stepping down from 11,400 volts to 2,850/2,950 volts.

The synchronous machine is a ten-pole generator having a synchronous speed of 300 r.p.m. The 60/25-cycle induction unit is wound for fourteen poles. At 60 cycles it would have a synchronous speed of 514 r.p.m. By holding the rotor speed down to 300 r.p.m. with the synchronous generator a slip of 214 r.p.m. is obtained in the induction machine, which gives 25 cycles at the collector rings of the rotor. The stator of the induction machine is connected to the 60-cycle line, and the rotor of the induction machine and the stator of the synchronous machine are both connected to the 25-cycle line. A transformer is required for connecting between the collector rings of the induction machine and the 25-cycle bus, because it is not practicable to build a high-voltage rotor for this machine, and this transformer also gives an opportunity for ratio adjustment for the control of current flow through the induction unit.

The induction machine will be excited from the 25-cycle side, the synchronous generator supplying this


Auxiliary Main
60 cycle bus
13,800 volts
25 cycle bus
11,400 volts
Auxiliary switches closed when breaker is open
Trip coil
Selector circuit breakers 3,000 amp. non automatic
Auxiliary switch
Potential transformer phase B for synchronizing
Low voltage
Speed limit
3,000 amp. circuit breakers automatic
Double secondary current transformers
2,000/5 amp.
2,500/5 amp.
Auxiliary relays
250 V. D.C.
Potential transformers
Reactor 5%
Transformer bank 17,100 kva. 11,400 to 2,800/2,900 volts X=4%
1,200 amp. circuit breakers non-automatic interlocked
Trip coil connected to auxiliary switches on generator circuit breakers
4,000 amp. current transformer
1,000/5 amp. current transformer
2,000 amp. circuit breaker non-automatic
Closing coil
Rheostat
Field
1,500/5 current transformer
500 amp. circuit breaker non-automatic
Relay
Relays
Slip rings for A.C. field
Ratio adjusting auto transformer
Speed limiting device
1,000 hp. 25 cycle induction motor for starting
Contactor panel
2,000/5 amp. current transformer
3,2000 kva 60/25 cycle induction machine 14 poles 300 r.p.m. X=13%
1,000 amp. disconnecting switch
1,000 amp S.P.S.T. solenoid operated oil circuit breaker
84 ohm non-inductive resistance
Starting controller hand operated and mounted on gen. bench board
25,000 kva. 25 cycle synchronous generator 10 pole 300 r.p.m. X=20%
1,500 amp. current transformer
115 kw 250 V. exciter

LAYOUT FOR OPERATING A 35,000-KW. SYNCHRONOUS FREQUENCY CONVERTER USED TO TIE TOGETHER THE 25 AND 60 CYCLE SYSTEMS

excitation, so that the power factor on both the 25-cycle and the 60-cycle side of the set will be approximately unity, with full load on the set and power flowing in either direction. In order to provide this exciting kva. for the induction machine the synchronous generator is designed for 85 per cent power factor lagging load as a generator.

The induction machine furnishes an electromagnetic tie between the 25-cycle and the 60-cycle systems, similar to a transformer tie between the two parts of a system of one frequency. In other words, this machine forms a voltage tie between the systems in addition to being a power and frequency tie, and any variation or disturbance of voltage on one system will be transmitted to the other through this tie in a manner similar to that obtained through a transformer. The effectiveness of this voltage tie is dependent upon the reactance of the circuit through the induction machine between the two systems.

The flow of wattless current between the two systems may be controlled by adjusting the transformer ratio or by changing the bus voltage on either the 25-cycle or the 60-cycle system. For general operation these ratios will be adjusted to give unity power factor.

# Phenomenal Growth in Brooklyn

## Edison Company Erecting New Superpower Station, Changing Its Distribution System and Expanding Its Various Departments to Take Care of the Ever-Growing Demands

By M. S. SLOAN
*President Brooklyn Edison Company, Inc.*

THE progress of the Brooklyn Edison Company, Inc., has been rapid and consistent since the opening of the European War, and since the end of the war a large and steady average increase in business each year has been maintained. In 1922 this increasing business had reached a point where the company was justified in adopting a plan of expansion for the next five to ten years, conservatively predicated on past requirements, of a far greater scope than any previously contemplated in its history. A brief synopsis of this growth and the plan of expansion now in progress of execution is presented here.

The growth of the company's business is compactly shown in the tables, which cover the increases in customers, output, capacity, demand, gross revenue, domestic and industrial development.

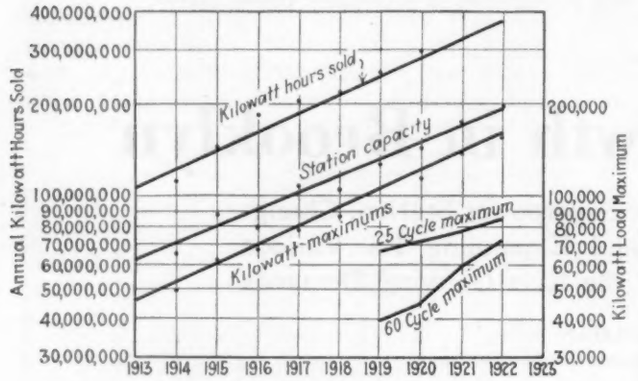
The diagram of output, maximum demand and capacity exhibited illustrates very clearly the basis of growth on which the present expansion is planned. The Brooklyn Edison Company, Inc., now has two generating stations in operation besides an interconnection with the plant of The United Electric Light & Power Company at Hell Gate in the Bronx. The largest of the two stations is on the East River at Gold Street; it has a capacity of 125,000 kw. of 25-cycle generators. The second station is at Sixty-sixth Street and New York Bay, having 65,000 kw. generating capacity at 62½ cycles. To meet the future requirements of capacity and economy, to standardize and simplify its type of service in phase and frequency, and further to decrease its cost of distribution and increase its efficiency, all tending to improve and lower its cost of general service, the company has financed and started a remarkably large and comprehensive program of construction and improvement, which when completed about the end of 1924 will have cost $23,000,000.

The basis of this development is the design and construction of what will be when completed the largest steam generating station in the world, at the foot of Hudson Avenue, Brooklyn, adjacent to the Brooklyn Navy Yard. This plant will be of 400,000 kw. to 500,000 kw. capacity, consisting of eight turbo-gen-

erators, three of which have been ordered. Each one of them will require a surface condenser of 70,000 sq.ft. cooling surface, supplied by two circulating pumps of 50,000 gal. each, or 100,000 gal. per minute total.

The station will be divided into four groups of two turbines each, each group being designed to be operated as a unit, the two turbines being served by eight boilers, each of 19,650 sq.ft. of heating surface, of which seven are required for normal operation of two units at maximum load, the eighth boiler being a spare.

The station is laid out on the most economical basis,




GROWTH OF THE BROOKLYN LOAD

the boiler room being adjacent to the waterfront, the turbine room next, and across a street the switch house, so that the least distance is required for handling coal and the most economical arrangement insured for transmitting the electric current from the generators to the switch house and thence to the transmission circuits.

The coal will be received in barges on the waterfront and hoisted by means of traveling towers on a coal trestle 112 ft. above the wharf, where it will be crushed and delivered to electric coal cars, which will be operated automatically and delivered to the bunkers over the boilers. From the bunkers the coal will be delivered by weighing lorries to hoppers of the individual stokers.

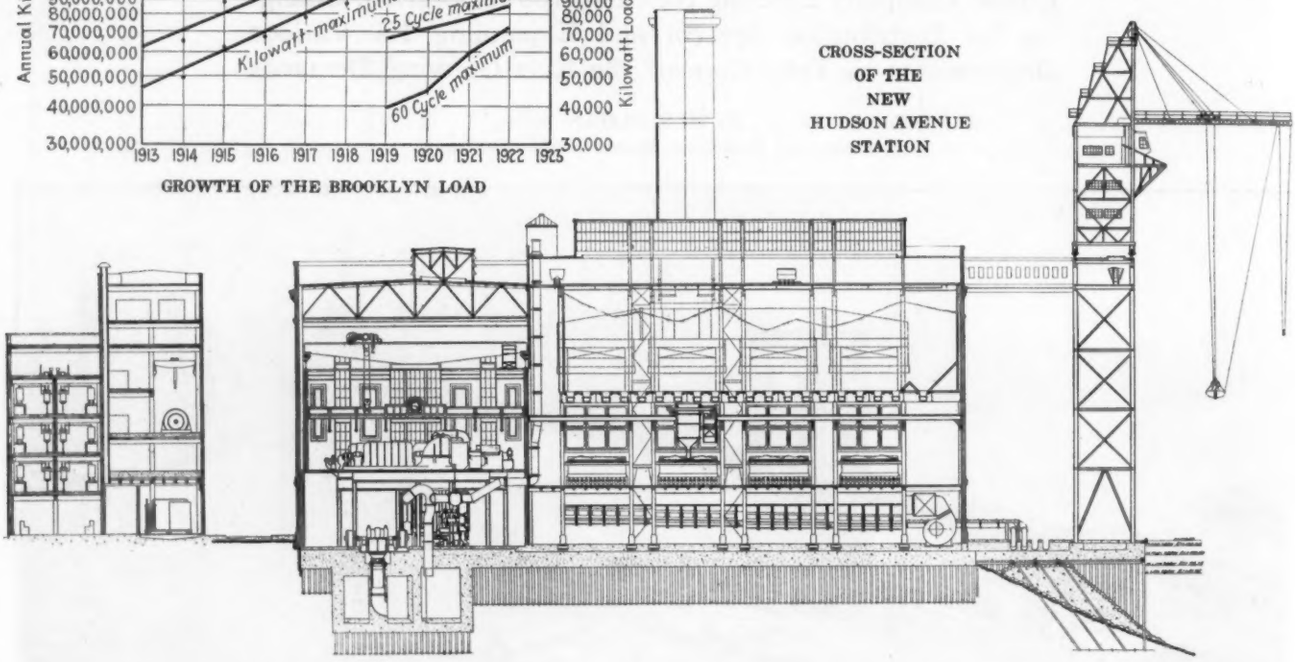
The bunkers will have a storage capacity of approximately 24,000 tons, which is six days' supply when full, based on normal steaming rate and the most economical load on the turbines. The ashes will be handled by means of hydraulic sluiceways under the ash pits of the boilers which lead to pipes under the surface of the wharf and thence to a pit on the dock, from which they will be dredged by locomotive crane into the ash scows and towed away to sea.

Steam will be received at the throttle of the turbo-generators at 265 lb. pressure, 200 deg. superheat. The electric current will be generated at 13,800 volts, stepped up to 27,600 volts in auto-transformers in the switch house and at this voltage transmitted to the 60-cycle substations of the company.

The turbo-generators have a guaranteed water rate of approximately 10 lb. per kilowatt-hour under the above conditions. It is confidently expected that the efficiency of this station will be approximately as follows:

| | 100,000 Kw., Full Load | 75,000 Kw., Three-quarters Load | 50,000 Kw Half Load |
|---|---|---|---|
| B.t.u. per kilowatt-hour | 17,380 | 16,760 | 18,000 |
| Total thermal efficiency, per cent | 19.65 | 20.39 | 18.97 |
| Lb. coal per kilowatt-hour | 1.34 | 1.29 | 1.39 |
| Lb. steam per kilowatt-hour | 12.97 | 12.42 | 13.19 |

It will be noted from the foregoing that changes in the distribution system are also in progress. Originally the generation of energy by the Brooklyn Edison Company was two-phase at a frequency of 25 cycles. In 1912



CROSS-SECTION OF THE NEW HUDSON AVENUE STATION

about one-quarter of the energy was being distributed by alternating current, part directly at 25 cycles to large customers, and the rest at two-phase, 62½-cycle energy by means of a limited capacity in frequency changers. As the requirements and the refinements of the modern utilization of electricity have developed they have shown the desirability of three-phase and 60 cycles as the general characteristics of use, and in consequence, following the actual trend of the company's experience, an elaborate program has been adopted of changing to this phase arrangement and frequency. This program also includes a large extension of the alternating transmission system at much higher voltage than at present, for economic reasons as well as for those of physical limitations. It has proved desirable as well to change over certain portions of the low-tension direct-current distribution to alternating-current.

These changes are soundly predicated on the experience of the last ten years, during which the alternating distribution of energy increased from 25 to 45 per cent of the whole and during which the frequency-changer capacity increased from 18,500 kva. to 28,500 kva. of 62½ cycles, while 114,500 kva. of 62½-cycle substation transformers were also added.

Based broadly on these proved conditions and safely and conveniently to distribute through the streets of Brooklyn the greatly increased supply of energy from the new Hudson Avenue station, it has been necessary to increase the transmission voltage from 13,200 to 27,600, and the company is this year installing 80 miles of 350,000-circ.mil, 33,000-volt cable as an addition to its present 490 miles of transmission. The company's transmission cable in the past has always been conservatively rated, and studies now under way indicate that an appreciable portion of the existing cable installed for operation at 13,200 volts may, by rebuilding the joints, be safely operated at the new transmission voltage.

To utilize the output of Hudson Avenue station and to render available the higher transmission voltage, it has been necessary to purchase eighteen 10,000-kva. substation transformers, which will be installed during 1923. These transformers are of the oil-insulated, self-cooled type, as contrasted with the company's previous practice of using air-blast transformers of 5,500 kva. rating.

The rapid rate of growth of the company has now warranted a decision to change the distribution system from two-phase, 2,400 volts, to the almost universal standard three-phase, four-wire, 2,400-volt system, and accordingly two new substations now under construction are being developed as three-phase substations. Other substations in the process of reconstruction are being changed to three-phase, and during 1924 new substations and reconstructed old ones will be similarly changed to three-phase.

The relatively greater growth of the alternating-current territory has warranted the change in frequency from 62½ cycles to the standard 60 cycles. Both the change in frequency and the change in the number of phases will ultimately displace the present frequency changers from service, and the company is therefore installing this year a new 35,000-kva. frequency changer to interconnect the 25-cycle and 60-cycle systems. Provision has been made for the installation of a second such unit during 1924 or 1925 if occasion necessitates.

The pure economics of distribution, street congestion and the difficulty of obtaining adequate locations for direct-current substations have led to a policy of taking expansions within the direct-current district on the 60-cycle alternating-current service, and to this end a three-phase skeleton distribution network is being built throughout the direct-current territory. New business in the direct-current territory is now being taken on as alternating current, and during the year approximately 10,000 kva. of existing direct-current load will be transferred to the 60-cycle system. It should be noted that this change of direct-current to alternating-current customers is not being confined to the fringe of the substation territory but permeates the entire direct-current district. Only such customers are being changed as show a minimum cost of change-over, and the change-over, if extended in the future, will follow this general program. It is expected that some load on the premises of individual customers will remain on direct-current service for a number of years, even though the major load of the customer be transferred to alternating current.

The design, construction and extension program of 1923 is an extensive and arduous one and represents not so much fundamental change as an additional step in the maturing growth of the company. It has been the policy of the company to retain its existing standards and methods until modification should be clearly advisable and warranted and then to change in such manner as to give reasonable assurance of being in the line of development for some years to come. It is the expectation that the program for 1923 will give a large measure of flexibility and ease in making extensions and additions during the immediately succeeding years and that these extensions may be along lines standard not only with the Brooklyn Edison Company but in the industry as a whole.

In order to effect the many changes in the distribution system required in the program just described, marked developments have taken place in the application of mechanical appliances using air power for constructing

NEW OFFICE BUILDING OF THE BROOKLYN EDISON COMPANY TO HOUSE ALL DEPARTMENTS

services underground and in the use of trenching machines for the quick construction of duct excavations and the speedy repair of a street. All of these methods have shown not only a decreased unit cost but a decreased time of installation and better and quicker service.

This growth of the company and the expansion of its various departments to take care of this growth have rendered it necessary during the past few years to rent considerable space and to establish many of its offices outside the present main office building. To remedy this condition the construction of a general office building has been authorized, and this is now in process of erection at the corner of Willoughby and Pearl Streets.

This building will be twelve stories in height, giving approximately 150,000 sq.ft. of available area for office purposes, and will be ready for occupancy in the early fall of this year. At that time all the departments will be brought together under one roof with the exception of certain of those concerned with construction, stores and distribution functions, for which it is planned to

GROWTH OF BROOKLYN EDISON COMPANY, INC., 1918-1923

| | Number or Amount 1918 | Number or Amount 1922 | Estimated Number or Amount Dec. 31, 1923 | Change 1922 Over 1921 | | Change 1918 to 1923, 1923 Estimated | |
|---|---|---|---|---|---|---|---|
| | | | | Number or Amount | Per Cent | Number or Amount | Per Cent |
| PROGRESS: | | | | | | | |
| Number of residential customers | 58,663 | 197,513 | 251,172 | 49,543 | 33.5 | 192,509 | 328.2 |
| Number of small stores and office customers | 30,002 | 47,596 | 60,383 | 4,721 | 11.5 | 30,381 | 101.3 |
| Number of wholesale customers | 7,189 | 9,417 | 9,636 | 842 | 7.3 | 2,447 | 34.0 |
| Total number of customers | 95,854 | 254,526 | 321,191 | 55,106 | 46.6 | 225,337 | 235.1 |
| Estimated number of families in Brooklyn (basis of five) | 387,000 | 419,484 | 427,390 | 7,906 | 1.9 | 40,390 | 10.4 |
| Residential customers as a per cent of number of families | 15.2 | 47.1 | 58.8 | 11.1 | .... | 43.6 | ..... |
| OUTPUT: | | | | | | | |
| Station output, kw.-hr. | 282,424,822 | 493,006,436 | 570,000,000 | 75,077,073 | 18.0 | 287,575,178 | 101.8 |
| Station capacity, kw. | 104,750 | 189,500 | *189,500 | 16,000 | 9.2 | 84,750 | 80.9 |
| Maximum demand, kw. | 86,000 | 164,495 | 188,681 | 26,695 | 19.4 | 102,681 | 119.4 |
| Pounds of coal per kw.-hr. | 2.5968 | 1.8854 | 1.8854 | †0.2802 | †12.9 | †0.7114 | †27.4 |
| BUSINESS: | | | | | | | |
| Gross revenue | $8,854,302 | $19,326,489 | $23,000,000 | $2,811,391 | 17.0 | $14,145,689 | 159.7 |
| Gross revenue per dollar of investment, cents | 22 | 29 | 27 | 0 | 0 | 5 | 22.7 |
| Kw.-hr. sold per capita of Brooklyn | 113 | 181 | 210 | 23 | 14.5 | 97 | 85.8 |

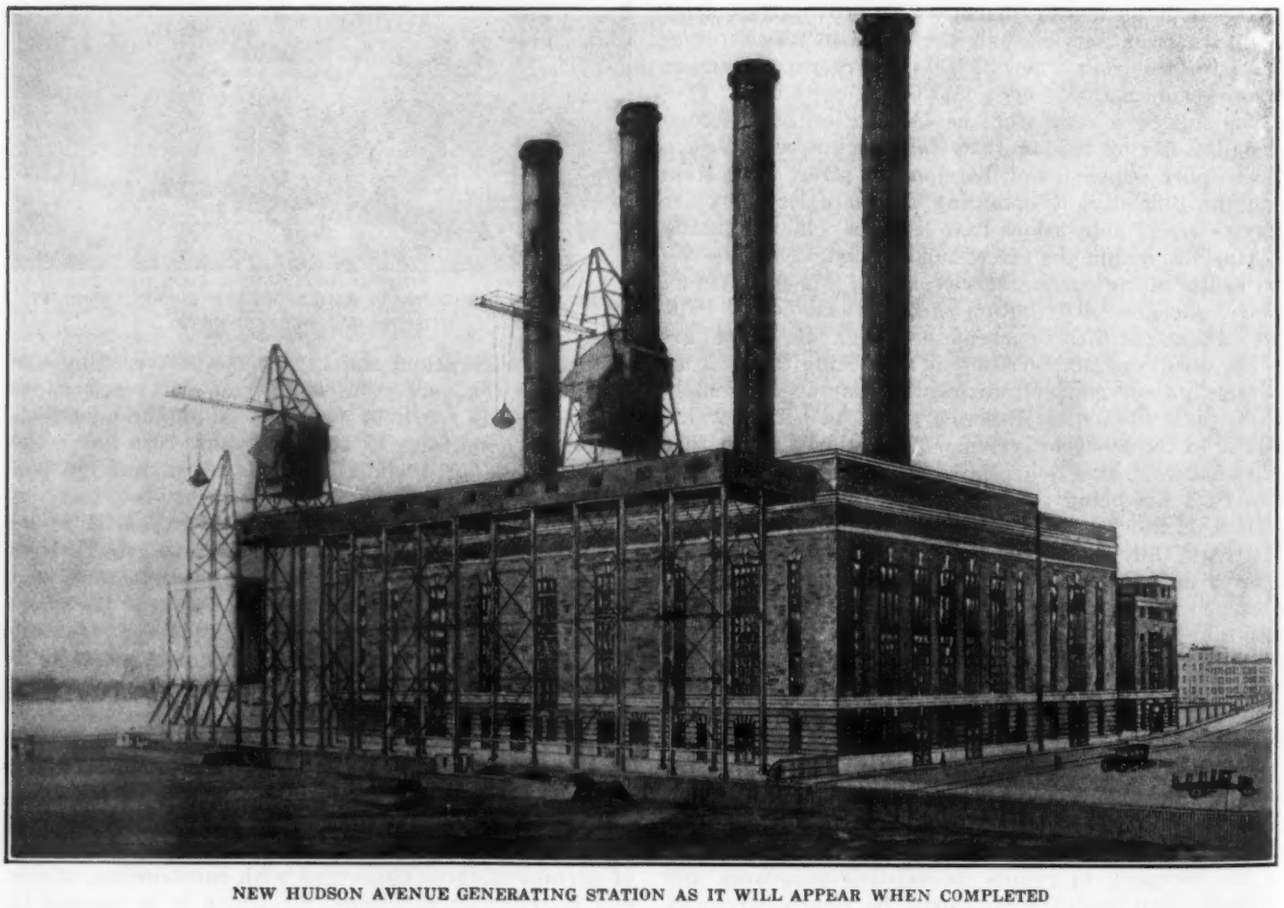
* Without Hudson Avenue. † Decrease.

erect a separate general service building at a convenient point in the near future. As the future growth of the company warrants, the general office building will be extended along Pearl Street as required.

Fuel oil will be used for generating the steam for heating the building. About 225,000 gal. of this oil will be used per year, and facilities for the storage of 35,000 gal. have been provided.

With all this increased and increasing business a strong and well-organized development is in operation for the continuous training and advantage of the company's personnel. These forces have increased from about two thousand in 1918 to nearly four thousand five hundred in 1923. The importance of surrounding this large number of individuals with proper conditions and opportunities is fully recognized, and the work is being carefully cultivated.

Within the past year a greatly improved educational training course has been established which has quadrupled the voluntary attendance as compared with previous years. This course, an employment division and a medical division are all in charge of the personnel bureau, which concerns itself entirely with the affairs of the employees in the company and their well-being. A medical examination is now required of all new employees, and free medical advice and regimen is open to all in the company. The employee and the job are studied with reference to each other, as well as the reward for excellence in the work, and an improved condition is beginning to show in the reduction of turnover. A self-governing club of the employees has been formed and is being developed by themselves with annual financial support from the company equal to what they raise by their own dues.

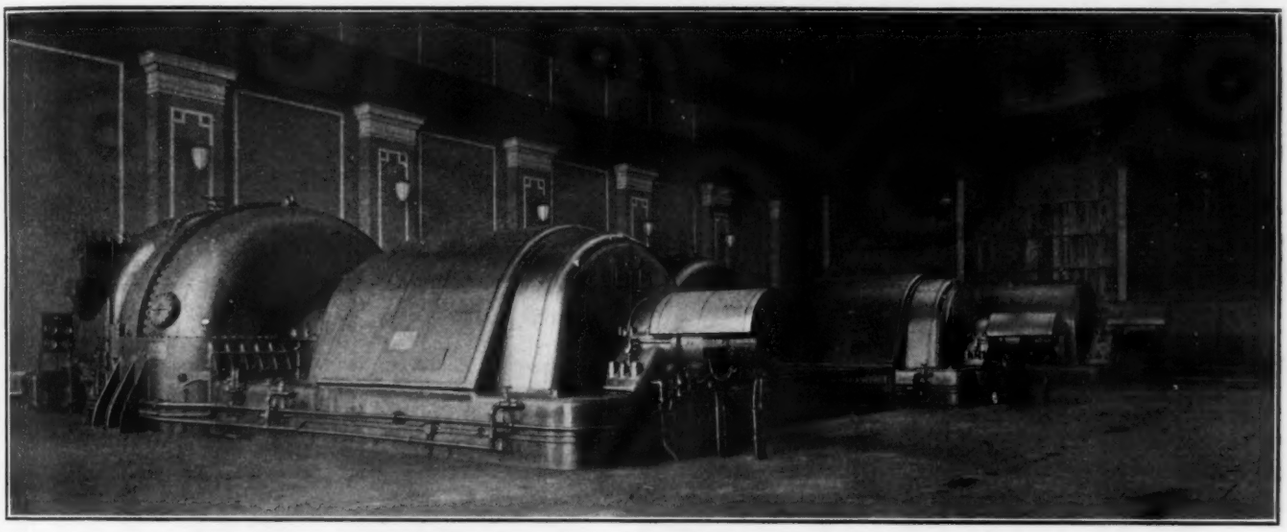


NEW HUDSON AVENUE GENERATING STATION AS IT WILL APPEAR WHEN COMPLETED

# Diversified Service in New Jersey

## Features of the Public Service Electric Company's System, Which Supplies Electricity to 202 Municipalities and Reaches the Large Industrial Centers Located Between New York and Philadelphia

By FARLEY OSGOOD
*Vice-President and General Manager of the Public Service Electric Company*



ESSEX STATION OF THE PUBLIC SERVICE ELECTRIC COMPANY

THE distinctive features that mark the operations of the Public Service Electric Company are, first, the wide extent of the territory served; second, the diversified characteristics of the communities within that territory, and, third, their rapid and continuing growth, both in population and industrially.

The area in which the company operates extends entirely across New Jersey, from the New York State line on the north to a point below Camden on the south and from the Hudson River and the waters adjoining New York Bay on the east to the Delaware River on the west. It embraces approximately 3,500 square miles, and electric service is supplied in twelve of the twenty-one counties of the state. In these counties live five out of every six of the state's inhabitants, while more than 90 per cent of the state's industrial activities are carried on therein. Probably no other electric utility in the nation serves so large a portion of the territory or of the population of the state in which it operates.

Two hundred and two different muncipalities, ranging in size from Newark, with more than 425,000 people, to communities of a few hundred, and including five cities with more than 100,000, five others with more than 50,000, ten others with more than 25,000, and sixteen others with more than 10,000, are supplied with light and power.

In their characteristics these communities are widely different. They range from great manufacturing centers, such as Newark, Jersey City, Paterson, Trenton, Perth Amboy and Camden, to purely residential towns of many classes, like Montclair, the Oranges and the hundreds of attractive suburbs in Bergen, Hudson, Essex and Union Counties in the northern section and in Burlington, Camden and Gloucester Counties to the south.

The social and industrial quality of the territory is to a large extent molded by its proximity to the great metropolitan cities of New York and Philadelphia. Sixty-six per cent of the total population served by Public Service live within 20 miles of the New York City Hall. Another 9 per cent live within 20 miles of the Philadelphia City Hall. Much of Public Service territory is within easier reach of the business center of New York than are many parts of New York itself.

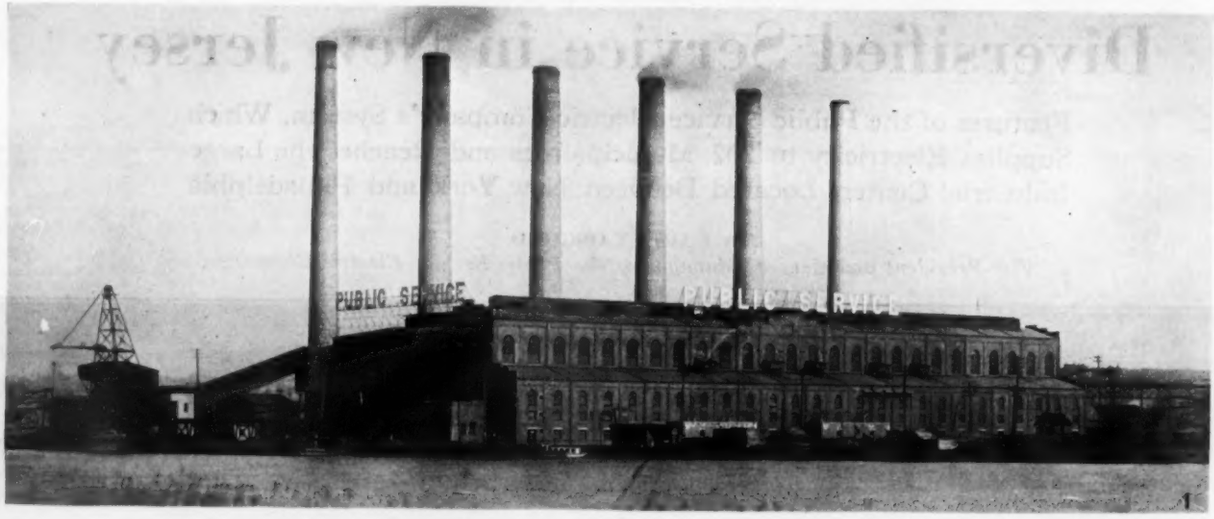
Nearly 75 per cent of the total population embraced in the twelve New Jersey counties served by the Public Service Electric Company live in six counties adjacent to New York City, although the combined area of the six is but 26 per cent of the total area served.

There is, then, in the northern part of the section of the state served by the company a territory about 20 miles in width, extending eastwardly from the banks of the Hudson and adjoining waters, with a high density of population; a territory extending 10 or 12 miles eastwardly from the Delaware with a lesser but still high density of population, and between them a territory of comparatively low density, and there is at the same time a concentration of industrial activities in these areas of dense population.

### Astonishing Growth of Population

The growth of all this community has been, and still is, remarkable. For the last twenty years there has been an accretion of population in the twelve counties served by the Public Service company of nearly 60,000 a year, and during this period the rate of population increase has been greater than that of New York City and much greater than that of Philadelphia.

## Marion and Essex Stations and Typical Branch Office and Substation

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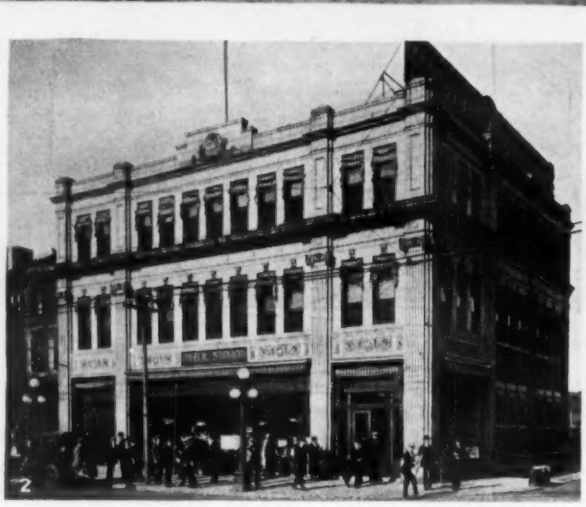

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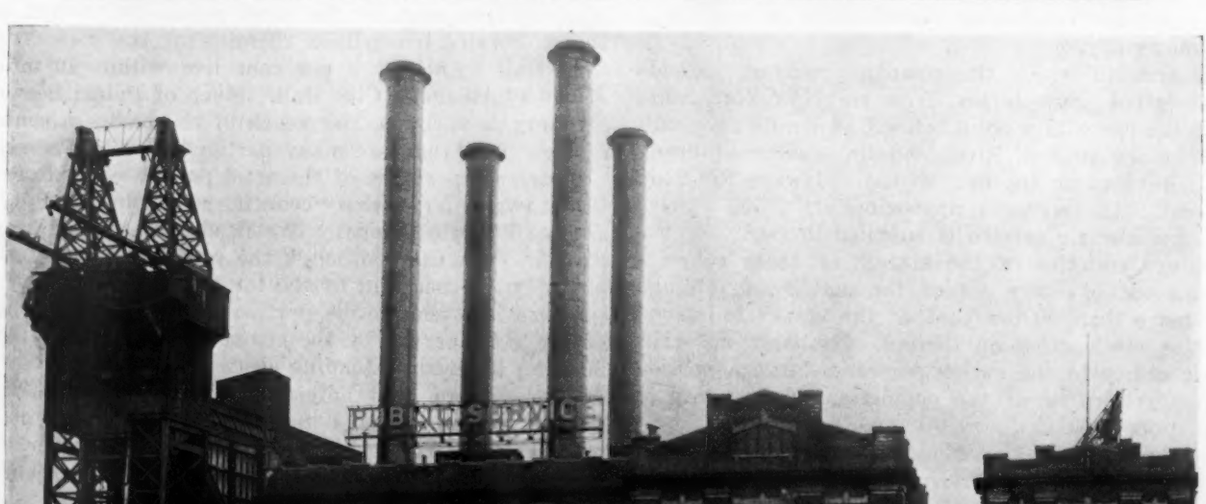


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There has been an equally astonishing growth in manufacture. From the standpoint of the central-station man, this may best be expressed in terms of primary horsepower used in industry. The United States industrial census shows that between 1904 and 1919—the latest census was taken in the latter year—there was for New Jersey an increase of 87 per cent in the horsepower of industrial prime movers, and for the electric generators included in this total an increase of 297 per cent.

This increase came in very large part from extension in the sale of electric station energy, since we find from the census figures that while electric horsepower generated by the user increased 180 per cent in the ten years, that purchased by the user increased 852 per cent, or at the ratio of more than four to one.

The picture of the industrial and population conditions which is presented in the foregoing paragraphs is essential to an understanding of the operations of the company itself.

### Nearly a Billion Kilowatt-Hours a Year

In 1922 the company generated, to meet the light and power requirements, including those of the Public Service Railway Company, which operates a system embracing nearly 900 miles of track and which carried in 1922 some 410,000,000 passengers, 939,413,040 kw.-hr., with a load factor of approximately 44 per cent.

This total of nearly a billion kilowatt-hours was produced in fourteen generating stations. The conditions existing in the territory which has already been described indicate, in general, the distribution of load, and the general arrangement of both generation and distribution systems follows conditions of load.

The northern and central sections are very completely tied together, and energy generated in any of the stations in these sections can be distributed throughout the entire area. The southern section, extending from Princeton, near Trenton, to below Camden, is operated independently.

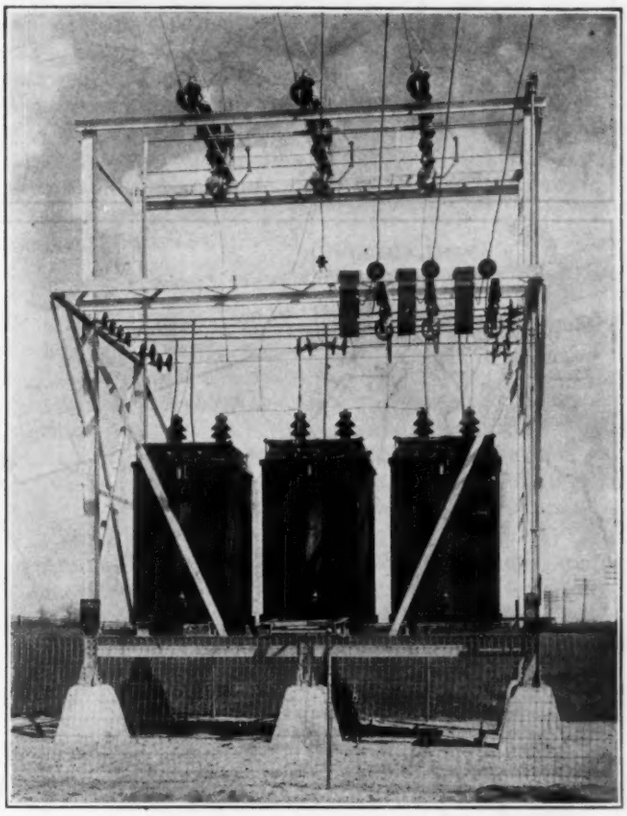
The total generating capacity of the fourteen stations is 290,900 kva., of which Essex station can furnish 85,000, Marion 90,500, Perth Amboy 22,500, and Burlington 37,500. Essex, Marion and Perth Amboy stations are in the northern and central sections. In addition, there are in this section stations of much less capacity and older design at Paterson, Secaucus, Edgewater, Hoboken, Crawford, Plainsboro, Red Bank and Newark.

The Burlington station is in the southern section and is reinforced by smaller stations at Trenton and Camden. To provide a further supply of energy when necessary, a tie with the lines of the Philadelphia Electric Company has recently been made at Camden.

The Essex station is the most modern of those operated by the company, and many of its engineering features are of interest. It is located at Point-No-Point on the Passaic River, about 2½ miles from the center of Newark, and contains at the present time one 35,000-kva. and two 25,000-kva. units, all operating at 13,200 volts, 60-cycle, three-phase.

The Passaic River at the point where this station is situated is of sufficient depth to permit coal and other material to be received by water. In addition, a spur from the Central Railroad of New Jersey provides for receipt of coal and supplies by rail. Coal received by water is handled by means of two towers erected on docks in front of the plant and capable of handling from barges 200 tons of coal per hour. Coal received by rail is handled by a system of horizontal and inclined belts and a skip hoist with a capacity of 90 tons an hour. Coal from both barges and cars is carried to bunkers at the top of the building adjacent to the boiler house. A bunker, of a capacity varying from 1,700 tons to 2,400 tons, is provided for each eight boilers. Each has a bottom dump, and coal is carried from bunker to boiler in weighing lorry cranes.

There are at present sixteen 1,370-hp. boilers, operating under forced and induced draft and equipped with modern underfeed stokers. Twelve of the sixteen are equipped with economizers. The entire switching equipment is of the remote-control type and with the



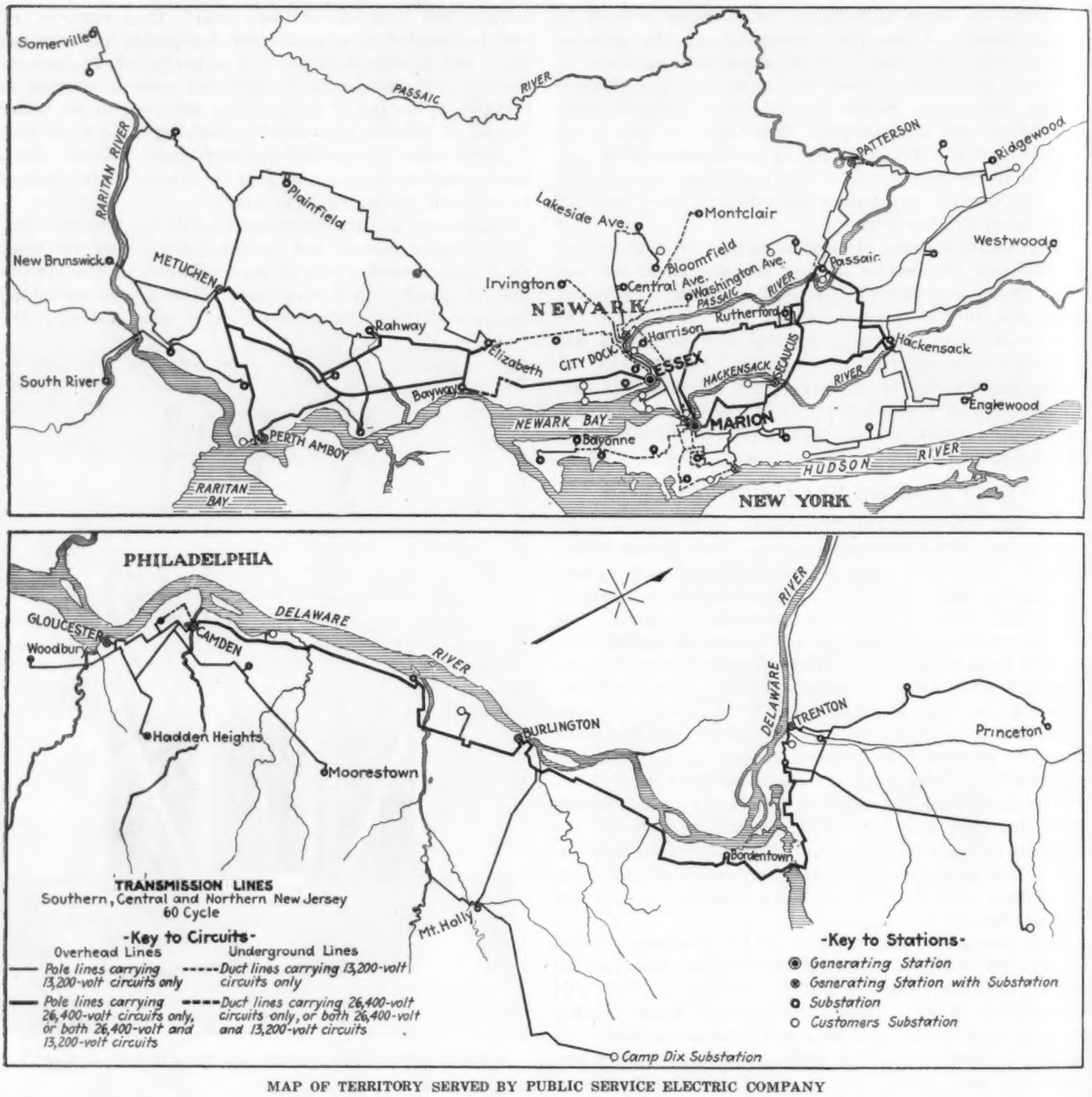
OUTDOOR SUBSTATION PUBLIC SERVICE ELECTRIC COMPANY

bus layout is flexible enough to prevent interruptions to service as the result of switch or bus failures. An electrically operated load dispatcher's board indicates diagrammatically the exact load conditions in the system network of which Essex is a part and is of great value to the load dispatchers under the conditions of complicated and frequent operating changes that prevail.

The architectural design of this station, both interior and exterior, is pleasing, the turbine room being a welcome departure from usual engine-room conditions.

Transmission from Essex station is, for near-by substations and plants of large consumers, at 13,200 volts. To more remote points it is, in order to cut down line losses, at 26,400 volts.

Extensions and improvements at the Essex station now under way will increase its capacity to 190,900 kva. An addition to the station is now being completed to house three 35,300-kva. turbo-generators, two of which will be in service during the summer of this year and the third in March, 1924. The boiler plant is at the same time being increased by eight 1,800-hp. boilers.




MAP OF TERRITORY SERVED BY PUBLIC SERVICE ELECTRIC COMPANY

The company has recently purchased twenty acres of land adjoining its station property, on which a high-tension substation is to be erected. This additional space will also be used to increase coal-storage capacity, a spur from the Pennsylvania Railroad permitting the use of the 600 coal cars now owned by the company for transportation of coal from the mines directly to the station.

The Marion station is built on the banks of the Hackensack River, on the outskirts of Jersey City. Its largest unit at the present time is a 20,000-kva. horizontal machine, constituting a part of the 60-cycle capacity. Of the station's total capacity of 90,500 kva., 28,000 kva. is furnished by 25-cycle generators furnishing energy for railway use.

The station's boiler plant consists of fifty 600-hp. boilers, thirty of which are equipped with Roney and twenty with underfeed stokers. Coal, from both barge and cars, is handled by means of a gantry crane and horizontal and inclined belt conveyors and by the use of this apparatus may be placed either in overhead bunkers or in storage under the crane.

Extensions and improvements at Marion now in process include the installation of a new 25,000-kva., 60-cycle turbo-generator, a 12,500-kva., 60-25-cycle frequency changer to be used in connection with the 25-cycle load, and a new switch house to take care of the increased number of feeders going out from the station.

The Perth Amboy station, on the Raritan River at Perth Amboy, has a generating capacity of 22,500 kva. in horizontal turbo-generators, with eight 600-hp. boilers fired with chain-grate stokers. Coal is received by water and by means of an unloading tower and an inclined belt conveyor is unloaded into overhead bunkers. The Perth Amboy and Essex stations are tied together by a 26,400-volt transmission line.

The Burlington station is at Burlington on the Delaware River, at about equal distance from Trenton and Camden. It has a capacity of 37,500 kva. in three

horizontal turbo-generators of 12,500 kva. capacity each. Its eight 600-hp. and two 1,500-hp. boilers are fired by underfeed stokers. Coal is received at this station by rail and handled by a skip hoist and inclined belts.

The 1922 peak load for the company's generating stations came in December, when 249,778 kw. was carried.

### THE TRANSMISSION SYSTEM

The company's transmission system consists of approximately 957 miles of line, operating in part at 13,200 volts and in part at 26,400 volts, interconnecting the fourteen generating stations and the seventy substations of the company and supplying energy to such large customer installations as are fed directly from the generating stations. The seventy substations have a static transformer capacity of 572,875 kva. and a rotary converter capacity of 120,884 kw., exclusive of that of street-lighting transformers through which are fed 50,500 street lamps.

In the large cities a considerable length of underground cable, both 13,200-volt and 26,400-volt, is in use, while at many points in the transmission system where conditions do not warrant underground construction and where open wire-circuits cannot be used to advantage aërial cable, the cable being of the same type used underground, has been installed with exceptionally good results, interruptions to service having proved negligible.

The system's substations operate at 13,200 volts, and where it is necessary to step down energy from the 26,400-volt lines the company's practice is to install an outdoor type of substation. A typical station of this class is the Bayway substation in the factory district of Elizabethport. Here are installed two 3,750-kva. water-cooled units placed on concrete foundations immediately under the high-voltage buses. High-tension oil switches, aluminum-cell arresters and buses are all carried on steel framework set on concrete foundations out of doors.

In most cases the transformers step down the energy to 2,400 volts on the secondary side, automatic feed regulators, a switchboard, a 2,400-volt double bus and 2,400 electrically operated oil switches being housed indoors. In cases where it is desired to have the transmission transformers deliver energy to station and substation buses connected with incoming and outgoing feeders operating at 13,200 volts the transformation is at the ratio of two to one, giving a secondary voltage of 13,200. A large number of the substations are operated with a primary voltage of 13,200, stepped down to 2,400.

Until 1922 the company's standard of distribution was 2,400-volt, two-phase, four-wire service to customers being furnished at 2,400 volts, or through transformers at 220/110 volts, three-wire, except in the case of about twenty large users, supplied with three-phase service at 13,200 volts or 26,400 volts. In 1922, however, a new standard was adopted, and for a large part of the system a change was made to three-phase, four-wire, with 4,150 volts between phase wires and 2,400 volts to neutral wires, which are in all cases solidly grounded at the substation. The change involved much work, both in the substations and in installations of line transformers, but resulted in an increase of distribution line capacity of about one-half and a reduction in line loss of 67 per cent.

All of the company's three-phase and about 85 per cent of its single and two-phase circuits are equipped with automatic potential regulators, installed in substations, to assure adequate and uniform voltage to users.

### A DECADE'S GROWTH IN DEMAND

Increase in demand has during the last ten years been little short of astounding. As was to be expected in a community of the character, war industries greatly increased industrial requirements both for power and light. Conditions following the war slackened in some degree the demand, which has, however, during the last sixteen months been renewed to a greater degree than ever before.

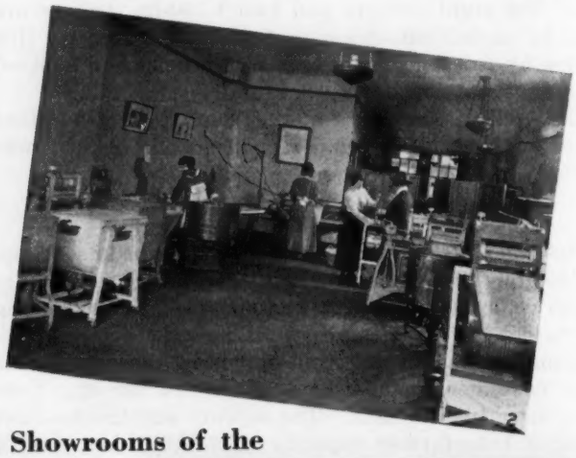
In 1910 the per capita consumption of energy for other than street-railway purposes in the territory amounted to 46.5 kw.-hr. per year, and the company had in service a meter for each 30.9 inhabitants. In 1922 per capita consumption was 205.2 and a meter was in service for each 7.5 inhabitants. In 1910 the kilowatt-hours sold, exclusive of energy generated for street-railway purposes, amounted to 89,742,689 and meters in service were 63,186. In 1922 kilowatt-hours sold amounted to 534,465,033 and meters in service to 344,309—a gain of 495 per cent in energy sold and of 445 per cent in number of meters in service. In the first four months of this year the gain in meters has broken all records for the same season of the year.

The development of the section of New Jersey served by the company is going on with increased momentum. Within a short time New York and New Jersey will be connected by a tunnel which will greatly increase ease of communication. A bridge to connect Philadelphia and Camden is under construction, and its completion will make the greater residential and industrial development of that portion of New Jersey surrounding Camden a certainty. The two states are now at work on the development of the port of New York, which lies largely within New Jersey waters. The port of Newark is already making a successful bid for increased business, while to further close the gap between New York and New Jersey projects for bridging the Hudson have gained substantial backing.

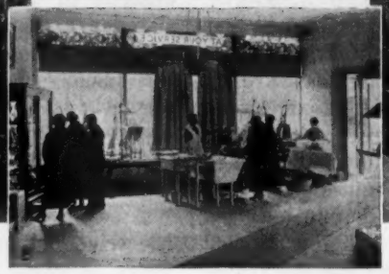
A survey of power requirements in the Public Service Electric Company's territory indicates for a number of years to come an increase in load demand upon the company of at least 30,000 kw. a year.

The company is laying its plans to keep pace with, or proceed a little in advance of, the needs of its territory. Within the last few months the Public Service Electric Power Company was organized by the Public Service Corporation of New Jersey, the parent company of the Public Service group of utilities, to construct and lease for 999 years to the Public Service Electric Company a new generating station with an initial capacity of 207,000 kva., to be enlarged within a comparatively few years to more than double this capacity. Within a short time construction work on this new plant will begin. The five units which will constitute the first installation will be two 45,000-kva. and three 39,000-kva. turbo-generators, all 13,200-volt, three-phase, 60-cycle.

The Public Service Electric Company feels that the industry is entering upon a phase of development in the use of electricity that is to be of stupendous importance both to the people of the country and to those within the industry itself, and that what is taking place in New Jersey is indicative of a general movement.



## Office Building and Showrooms of the New York Edison Company



THE showrooms of the New York Edison Company are located at advantageous points throughout the territory to afford the greatest convenience to customers: 1 and 8—Tremont Avenue display room, in the Bronx; 2—Bureau of Home Economics on the third floor at 124 West Forty-second Street; 3—Showroom on 125th Street; 4—Showroom on 149th Street near Third Avenue in the Bronx; 5—General office building, Fifteenth Street and Irving Place; 6—Appliance display room at 124 West Forty-second Street; 7—East Eighty-sixth Street office; 9 and 10—Showroom at Fifteenth Street and Irving Place.

# Metropolitan Merchandising

## A Review of the Policies Adopted and the Recent Activities in Selling Appliances Carried on by the Various Central-Station Companies Operating in the New York Metropolitan District

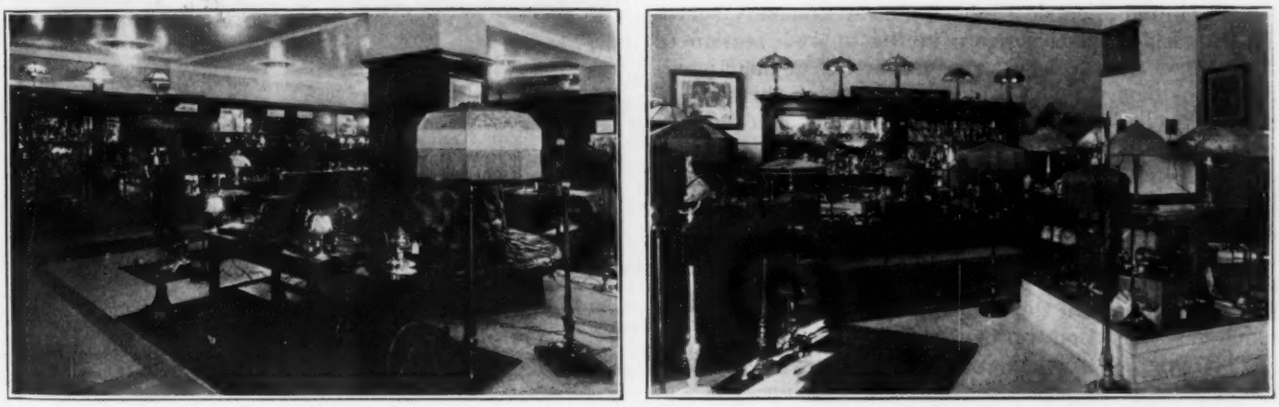
THERE is an exceedingly interesting situation in the metropolitan district as regards the merchandising of electrical appliances by the central-station companies. There are five electric light and power companies in or about New York City that may logically be considered in the group—the New York Edison Company and the United Electric Light & Power Company on Manhattan Island and in the Bronx, the Brooklyn Edison Company in Brooklyn, the New York & Queens Electric Light & Power Company in Long Island City, and across the Hudson River, with headquarters in Newark, the Public Service Electric Company. Each is confronted with conditions rather different from those confronting the others, and there is a considerable diversity of merchandising policy between them.

The Brooklyn Edison Company and the Public Service Electric Company are actively engaged in merchandising appliances for profit. The United Electric Light & Power Company is also selling appliances energetically, but profit is made a minor consideration. The New York & Queens Electric Light & Power Company merchandises appliances on a profit-making basis in its salesrooms, but is devoting most of its attention now to wiring old houses and obtaining customers in a very rapidly growing territory.

The New York Edison Company for many years has maintained display rooms and actively demonstrated appliances to the public, but for some time has not engaged in any merchandising activity. Recently, however, a new policy has been inaugurated under which household appliances of all kinds are being sold out of the Edison shops on deferred payments, charged with the monthly service bills. This merchandising, however, is being done in behalf of the manufacturer with consigned stock and does not pass through the books of the Edison company. A detailed statement of the Edison company's present attitude and policy toward merchandising by Arthur Williams, general commercial manager, appears on page 1211 of this issue.

### NEW YORK EDISON POLICY

The Edison shops and the Edison policy on merchandising will be of particular interest to utility men attending the convention. In the early days of central-station commercial activity the New York Edison Company sold appliances just as it sold power, lighting, signs and other applications of the service. With the rapid growth of the business and the increase in the appliance line, the Edison company withdrew from the merchandising field and turned over the entire function of retailing energy-consuming appliances to the local contractors and dealers. Since then the company has maintained its showrooms for display and demonstration purposes only. The devices have been shown but not sold, and customers have been referred to the dealers or manufacturers and orders have been taken on memorandum for delivery by the manufacturer or dealer.



APPLIANCE SALESROOMS OF THE UNITED ELECTRIC LIGHT & POWER COMPANY. LEFT, SHOWROOM ON FIFTH FLOOR 130 EAST FIFTEENTH STREET. RIGHT, SHOWROOM AT EIGHTY-NINTH STREET AND BROADWAY

The Edison company therefore has stood before the industry as probably the foremost exponent of the policy opposed to the merchandising of appliances by the utility. However, the American people have undoubtedly adopted the easy-payment plan as the method by which they prefer to purchase household equipment, and this policy of the Edison company has naturally made it harder for its customers to acquire electrical appliances than it is for customers of another utility that sells on deferred payments, charged with the service bills. A few months ago therefore the Edison company informed its customers and began to advertise in its stores that appliances could be purchased by consumers for a small cash payment and the balance in deferred payments monthly. Deliveries are made by the manufacturer or the dealer by whom the device purchased has been consigned, except in urgent cases where the customer wishes to take the appliance away immediately. To

ONE OF THE BROOKLYN EDISON COMPANY'S SALESROOMS

provide for such cases a small consigned stock is kept on hand.

The New York Edison Company supports the appliance market with generous advertising, displays, demonstrations and lectures, and it plays the major part in an annual electric show. The company operates a main salesroom at its general offices and has a number of branch showrooms throughout the city.

### UNITED COMPANY'S POLICY

The United Electric Light & Power Company serves 75,000 residential consumers in the uptown section of New York, with a very large proportion of apartment-house customers. The company maintains three salesrooms, twelve inside appliance salesladies and twenty outside appliance salesmen, and operates two wagon crews of eight men each. About $350,000 in appliances has been sold in the last twelve months. The company advertises extensively in the newspapers, direct by mail and on billboards, many of these displays featuring electrically operated clocks to attract attention. It takes active part in the annual electrical show and does much demonstration work.

The chief merchandising effort is made through monthly sales in which a particular appliance is featured at special inducements. Advertising matter is sent directly by mail to all customers, with an easy-payment

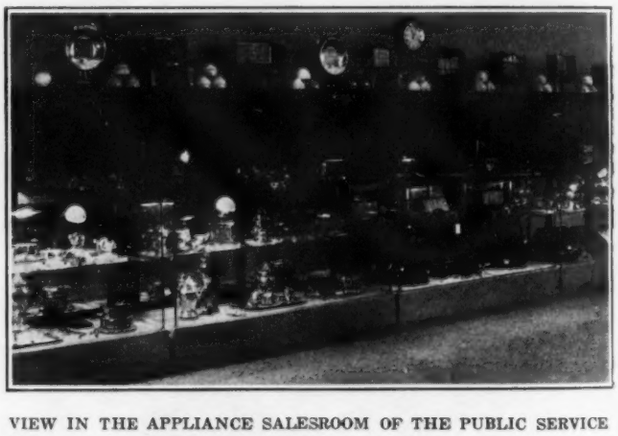
OFFICE OF THE NEW YORK & QUEENS ELECTRIC LIGHT & POWER COMPANY AT FLUSHING, L. I.

offer, and the wagon crew sells from house to house, using the special appliance of the month as a leader. A recent survey of all residences served by the United company led to a very energetic drive to fill up the empty sockets on the lines, and this greatly increased lamp sales.

### BROOKLYN EDISON ACTIVITIES

The Brooklyn Edison Company has been one of the most active of the metropolitan central stations in the sale of merchandise and in the last two years has increased its retail appliance business greatly. The company operates a main appliance shop at its general offices and is now erecting a very handsome new building, the conspicuous feature of which will be a large appliance store. There are also seven branch offices with salesrooms.

In 1921 the Brooklyn company sold nearly 25,000 appliances. Very satisfactory results were received from the house-to-house canvass by crews of salesmen working on commission. For several years it has been the practice of this company to conduct a special sale each month, featuring a specific appliance. This device has often been a special purchase for the sale, but has been sold at list price at a profit, and the privilege is



VIEW IN THE APPLIANCE SALESROOM OF THE PUBLIC SERVICE ELECTRIC COMPANY, NEWARK, N. J.

extended to the local dealers to take orders for this device at the same price and at a profit.

Remarkable results have been achieved in Brooklyn through the operating of a wagon crew. Forty men work from one wagon, carrying appliance samples to assigned blocks, returning to the wagon when the sale is made for a new sample. Post cards are received through the advertising, and these leads are used in the wagon selling. For each sale made on "cold canvass" the salesman receives a special assignment to a block from which a post card has been received. The location of this lead is not told, however, and the salesman canvasses the block until he finds it. These men, calling at the customers' homes, have made 40 per cent of all sewing-machine sales, an even greater percentage of vacuum-cleaner sales, and virtually 90 per cent of all clothes-washer sales. They work by the day on salary and commission.

The Brooklyn company last June conducted a sewing-machine school that proved an interesting innovation. A course of four lessons was given, and 153 pupils completed the course. There were also eighteen visitors, four of whom purchased electric sewing machines. In-

struction was given to 52 per cent of the women who bought sewing machines last year.

### NEW YORK AND QUEENS POLICY

The New York & Queens Electric Light & Power Company maintains an appliance saleroom in each of its offices in Long Island City, Jamaica, Flushing, Bayside and Ridgewood. All merchandise is sold at a profit and mostly for cash. Only a few outside salesmen are employed by the company, but the manufacturers of standard appliances all carry on an active campaign resulting in large aggregate sales to its consumers, who have increased rapidly in the past five years. The company, however, plans as it approaches more nearly to the so-called saturation point to expand its merchandising activity and materially enlarge its sales force.

### MERCHANDISING IN NEWARK

The Newark territory of the Public Service Electric Company is essentially a part of the great metropolitan district of New York. The company operates also throughout a large part of the State of New Jersey, which has necessitated a somewhat different commercial organization than that of the companies already discussed. It comprises a number of divisions in which there are district offices in all the important communities, with salesrooms in which active merchandising is carried on. A great deal of attention has been given by this company to the development of appliance business, and this is one of its principal commercial interests. There are eighty-seven combination salesmen on the staff selling both electric and gas appliances, fifty-one special appliance representatives selling only vacuum cleaners and washing machines, and thirty-nine people employed in selling in the various display rooms.

The Public Service Electric Company has made a notable success in campaign sales. In 1922 a special drive sold 22,000 flatirons, and the sales so far this year indicate a total of 25,000 for 1923. Last year the company sold 7,150 vacuum cleaners, and it has set the bogey for 10,000 cleaners for 1923, with 3,925 gone by April 30. A special percolator sale that began in April disposed of 196 in the first three weeks. In all, 72,639 appliances were sold in the last year.

These sales are all very carefully planned. A general outline of the new business plans goes out to all

## A Statement of The New York Edison Company's Merchandising Policy

**THE news that electrical appliances are now being sold on the deferred-payment plan in the showrooms of the New York Edison Company has naturally been received with great interest by electrical men, inasmuch as this company has long been looked upon as opposed to the sale of merchandise by the central station. The ELECTRICAL WORLD, therefore, invited Arthur Williams, general commercial manager of The New York Edison Company, to submit a statement of his company's policy on appliance merchandising for publication at this convention time. Mr. Williams says:**

In the merchandising of electrical appliances the New York Edison Company continues, in principle, a policy adopted a number of years ago when the company definitely gave up contracting for installations and the sale of fixtures, motors and other appliances. It did this in the belief that in opening the New York field to the electrical contractor and to manufacturers of fixtures and appliances, and thereby eliminating itself as an element of competition, it was serving not only its own interests and those of the general public, but also the larger interests of the electrical industry, broadly speaking. To the company it seemed that it should devote itself to the generation and distribution of electrical energy as its principal merchandising effort. I believe there has been no reason to regret taking this step, although at the time it appeared almost revolutionary, inasmuch as it was apparently eliminating a legitimate activity and deprived the company of large revenue, both existing and prospective.

But coincident with the adoption of this policy the company recognized that it must continue its best endeavors to create a permanent demand for electrical energy on the part of the public in as many different directions as possible. Therefore it employed the best available agent of publicity —the public press—meanwhile not neglecting the very wide range of other advertising methods in the way of text and illustration —to inform the public of the advantages of electric service and of the constantly increasing appliances for its economic utilization.

As a matter of fact, what may be called the company's intensive merchandising effort is concentrated upon three points: First, of course, the providing of the best service attainable at the lowest possible prices; second, the constant effort, in the light of the most approved forms of publicity, to create a desire for electrical service and to see to it that means of satisfying this desire are adequate and conveniently placed; third, the maintenance of a competent organization to retain customers once secured and prepared to meet any question indicating a feeling of dissatisfaction with the company's service in such manner that the customer shall continue satisfied with our service. One of the results which we attribute to our policy of concentrating our merchandising efforts upon the points just outlined is the establishment of approximately 2,500 contracting and merchandising dealers in New York City. The number increases annually, and the character of the service rendered, the premises where exhibits are on display and the exhibits themselves are all constantly improving.

It has been urged that the New York Edison Company, following the example of many other central-station organizations, should abandon its policy of encouraging independent agencies and engage in direct merchandising. Undoubtedly, a very wide development along such lines could be attained. But activity of that character would require that the company confine its selling efforts to one, or at most a very few, types of appliances or apparatus. The company feels that it should always be helpful in the merchandising of all approved appliances.

In the company's showrooms, at the moment, there are on exhibition no fewer than twenty-four types of vacuum cleaners from as many different manufacturers; there are twenty-three types of washing machines and twenty-one types of electric irons—to mention only three of a very long list of appliances on display. During the past month sales have been consummated in the interest of seventy-four different manufacturers or agents who are making use of the facilities of the company's showrooms in order to reach the New York public.

One of the principal obstacles in the use of electric service is the initial cost of equipment and appliances. For many years the company has advanced funds which prospective customers require for wiring their premises, to be repaid on the installment plan. Recently this privilege has been extended to purchasers of new household appliances. In the case of appliances, however, credit is confined to customers in good standing. Today, therefore, no one need deprive himself of either electric service or any kind of household equipment on the ground of first cost. Here again, as when the purchaser himself makes full and immediate payment, the customer chooses what he wishes to use, the company receives and transmits his order to the manufacturer or agent and, upon satisfactory fulfillment of the order, pays the bill, being paid in turn by the customer.

Had not the present course of independent merchandising development seemed more desirable from the standpoint of the public at large, the customers of the company and the company itself, it surely would have been changed. In view of the fact that the company desires to follow such policies as best serve all, the present methods will be changed should others be found more useful and effective in carrying out the purpose of attaining the ideals which have been established as standards of possible attainment in our company's branch of New York's public utility service.

ARTHUR WILLIAMS,
*General Commercial Manager.*
*The New York Edison Company.*

offices three months before the drive starts, and special meetings are held to organize friendly competition between divisions. All the campaign work is backed up strongly with newspaper and direct-by-mail advertising, which is written after the style of department-store and mail-order copy. During one vacuum-cleaner sale a broadside folder went to 150,000 customers. But results have been gained for this company by specialization, and a separate crew is now being organized to sell domestic refrigeration. Other special crews are planned for other large appliances that are still in the pioneering stage, such as the fireless cooker, the ironing machine and the dishwasher. These crews will be put to work as the demands for these devices justify it.

In short, the general aspect of central-station appliance merchandising among the companies serving the New York metropolitan district is typical of the appliance situation throughout the industry. Steadily increasing attention is being given to the development of the residence appliance load, and in order to build up household utilization of electric service for labor saving, cooking and comfort the light and power companies have found it necessary to engage in the retail sale of electrical merchandise on a large scale. The success which has attended this work, especially where the business has been put on a strictly merchandising basis, has been such that the scale of the operations has steadily increased and indicates a continued expansion.

# Electric Trucks in Greater New York

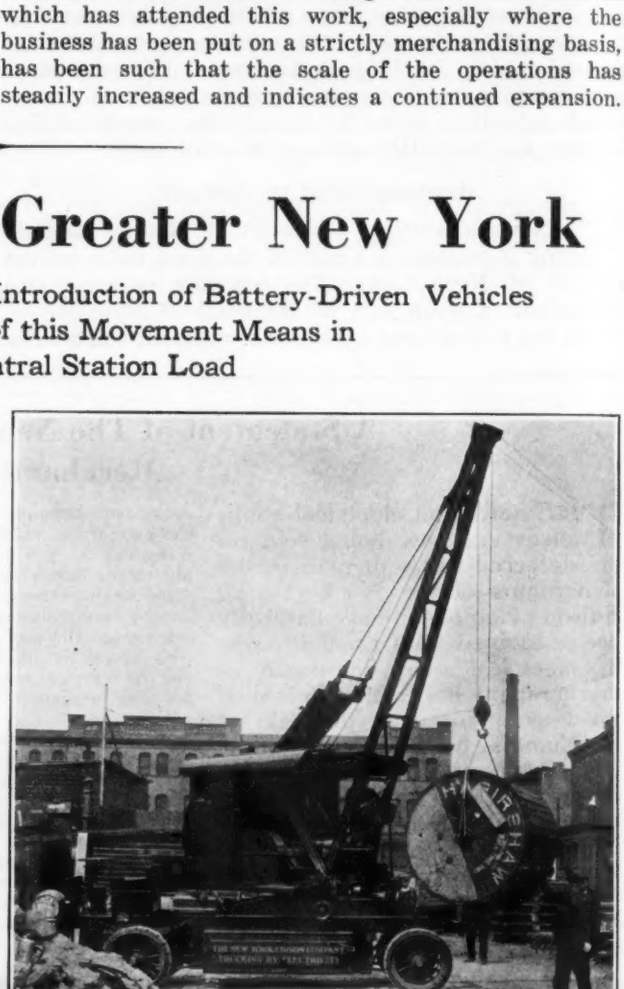
## A Record of Remarkable Progress in the Introduction of Battery-Driven Vehicles —What the Rapid Growth of this Movement Means in Augmenting the Central Station Load

TRANSPORTATION in New York City has become a problem to which both city officials and engineers are devoting a great deal of attention, and the electric vehicle bids fair to play no small part in speeding up deliveries and relieving to a marked degree the congestion of the streets. The adaptability of the "electric" to the short-haul, frequent-stop city delivery makes it peculiarly suitable to the prevailing conditions, and although the number of electric trucks now in use is but a small percentage of the total, they are each year coming into more and more general use by business houses that make a careful analysis of their costs of delivery.

The accompanying tabulation, showing that there are now in use in New York City a total of four thousand electric vehicles, also shows the various kinds of business which have found it economical to adopt electrics for their delivery service.

### NEW YORK EDISON COMPANY A PIONEER

The New York Edison Company has long been an active advocate of the electric vehicle and believes in setting an example in this respect, for it uses in its own service a fleet of 121 electric trucks of all sizes. In the promotion of this business the company has organized an electric vehicle bureau in which four men are engaged, in co-operation with the manufacturers, selling trucks. In 1922 the company sent out more than one hundred thousand sales letters, and the company's records show that one thousand electric vehicles have been sold in the metropolitan district during the last two years.



ELECTRIC TRUCK AND DERRICK USED BY THE EDISON COMPANY TO HANDLE CABLE REELS AND FOR OTHER HEAVY WORK

There are now in operation in New York eight electric garages, housing 275 cars and consuming a half million kilowatt-hours annually, netting the central-station companies more income than they receive from four thousand houses, or as many houses as there would be along 30 miles of street. What the use of the electric vehicle means in energy consumption in New York City is shown by the fact that in 1922 energy in excess of 4,000,000 kw.-hr. was used in the charging of vehicle batteries. Sales of electric trucks during the first three months of 1923 totaled 225, as against only sixty-four during the same period a year ago.

Express and trucking companies, department stores, laundries and provision dealers have been among the largest buyers of electric vehicles. Typical instances

NUMBER OF ELECTRIC TRUCKS USED IN NEW YORK CITY

| | |
|---|---|
| Department stores (seventeen) | 383 |
| Bakers (fourteen) | 479 |
| Bottling companies (twenty-nine) | 561 |
| American Railway Express | 400 |
| New York Edison Company | 121 |
| Eleto Company (department-store delivery) | 54 |
| Consolidated Gas Company | 52 |
| Westcott Express Company | 51 |
| Bush Terminal | 36 |
| United Electric Light & Power Company | 31 |
| New York Transfer Company | 29 |
| National Biscuit Company | 28 |
| Horn & Hardart (restaurants) | 27 |
| H. J. Heinz Company | 26 |
| Pine Hill Crystal Spring Water Company | 23 |
| All others | 1,699 |
| Total | 4,000 |

of the adoption of the "electric" are interesting as they show the tendency to use them rather than gasoline or the horse-drawn vehicle. The Pilgrim Laundry, which is one of the largest laundries in Brooklyn, has completely motorized its delivery. It now owns thirty-eight electric and only four gasoline cars, or better than 90 per cent of its trucks are electric.

The American Railway Express Company is the largest single user of electric vehicles in Greater New York, and 83 per cent of all its motor vehicles now purchased for the metropolitan district are electrically propelled. This company is working to a virtually complete electrification of all its trucks used in the congested districts which prevail in a city such as New York.

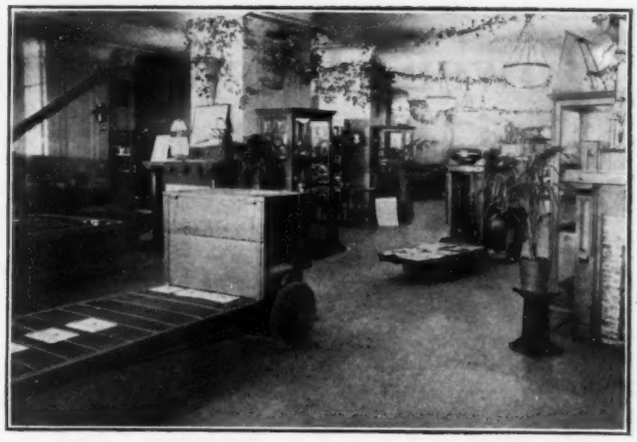
A large baking company in Newark, N. J., last winter placed an order for a fleet of 177 electric trucks and forthwith advertised for sale all of its gasoline and horse-drawn equipment. It has been the experience of this company that the electric vehicle is not only much cheaper to operate and maintain, but that it can cover a given route much faster than a gasoline truck, owing to the fact that in congested traffic it can start and stop quicker than the other car. This observation has held true even on the longest routes with the less frequent stops.

### Obstacles Disappearing

Many conditions which heretofore have been detrimental to or have affected adversely the sale and use of the electric vehicle have been overcome within the last year. With the development of the high-speed gasoline truck it was felt for a time that the "electric" could scarcely compete with it, but this very characteristic has proved to be more of a hindrance than a help in cities and the electric truck is now coming into its own.

Another obstacle which has been overcome is the lack of information and data on the operation and maintenance of electric vehicles. The organization of an electric vehicle school in New York last winter was a big step forward in making this much-needed knowledge about the electric truck available. The popularity of the school may be judged by the fact that it had an enrollment of three hundred, whereas only about forty men had been expected to attend. It was conducted in conjunction with the Vehicle Bureau of the National Electric Light Association, and most of those who attended were operators and maintenance men sent by vehicle owners. A number came from other central-station companies.

The central-station man himself has been slow to push the electric vehicle, although he has recognized its possibilities as a load builder. That this attitude is changing rapidly is seen in the fact that in the last twelve months central stations in the metropolitan district have bought



INDUSTRIAL ELECTRIC VEHICLE SHOW IN PUBLIC SERVICE ELECTRIC COMPANY'S SHOWROOM, NEWARK

a hundred electric trucks and that fifteen central stations in the United States have bought a total of 250 trucks.

### Vast Market Ahead

While it is becoming increasingly evident that the electric vehicle will play an active part in the solution of New York City's transportation problem, its use is still in its comparative infancy and there is plenty of room for growth. A recent survey by the engineers of the New York Port Authority disclosed that 72.7 per cent of the commercial vehicles used in New York City are still horse-drawn, 25.8 per cent are gasoline trucks and only 1.5 per cent are electric. There is no doubt that all of the horse-drawn vehicles could be replaced economically by electric vehicles or that a large part of the work done by gasoline trucks could be profitably and more economically done by the "electric." This means that from 80 to 85 per cent of the transportation of goods in New York City streets should fall to the lot of electric vehicles.

With the additional electric vehicles which have been sold this year, The New York Edison Company estimates that approximately 10 per cent of the trucks in use in New York City and surrounding territory are of that kind. Taking the entire country over, only 2 per cent of the total number of trucks in use are electric. There should be, it is conservatively estimated, 200,000 electric vehicles in the United States, averaging an energy consumption of 6,000 kw.-hr. per truck per year. This means that here alone is a potential market for the central-station companies to sell 1,200,000,000 kw.-hr. annually by the proper development of the vehicle load, nearly all of which would come at off-peak hours and at a very profitable rate per kilowatt-hour.

A FEW OF THE ELECTRIC TRUCKS USED BY THE NEW YORK EDISON COMPANY

# Power Development in New York City

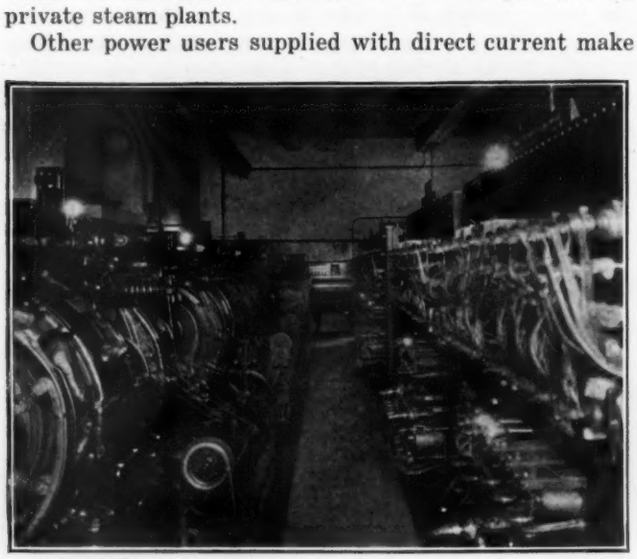
## Large Buildings Housing Many Small Manufacturers Create Unusual Conditions—Refrigeration Load Has Grown Rapidly—Private Plants Are Fast Giving Way to Service from the Central-Station Companies

BECAUSE it is primarily a commercial and financial center, Greater New York presents a power problem to the central-station companies that differs in many respects from that found in cities where industrial activity is more predominant. As might be expected in a city of these characteristics, particularly on Manhattan Island, the greater number of important electrical installations are in office buildings, commercial structures, hotels, department stores, apartment buildings, places of amusement and so forth. The metropolitan district, however, must be considered as including not only Manhattan, the Bronx and Brooklyn, but Queens County and the contiguous territory across the Hudson River in New Jersey as well, for it is to the two latter territories that the growing manufacturer of New York City must turn to find room for industrial expansion, and it is there that typical industrial power applications in the usually accepted sense are developing.

The New York Edison Company supplies energy in Manhattan Island from the Battery to 136th Street and in the greater part of the Bronx. With the exception of a comparatively few customers supplied under high-tension contracts, the service in Manhattan is direct current. In the Bronx it is alternating current.

Among some of the large primary power customers which are supplied by The New York Edison Company are the Third Avenue Railway, the Hudson & Manhattan Railroad Company and several plants of the American Ice Company, one of which has a demand of 1,828 kw. during the summer months. Nearly all of the larger refrigerating businesses have been taken over by the company since 1916, when it became evident to the ice manufacturers that the use of central-station service would be far more economical than the operation of private steam plants.

Other power users supplied with direct current make up a large volume of business of a highly diversified nature, and it is interesting to note that manufacturers of the same or closely related products have gravitated toward each other until they have formed districts given over to their particular class.



BANK OF ELEVATOR MOTORS IN THE CUNARD BUILDING, WHICH USES EDISON SERVICE

### Sections of the City Differ

In a broad sense, Manhattan Island may be considered in three general sections—the downtown, in which the largest office buildings are located; the uptown, which is in the main residential, and the midtown, having some of the characteristics of the two other sections, with many others distinctly its own. In the last-named zone are to be found many large office structures, most of the theaters of the city, substantially all of the department stores, many apartment houses, and a large and important grouping of manufacturing loft buildings. In it is also located the center of the printing industry.

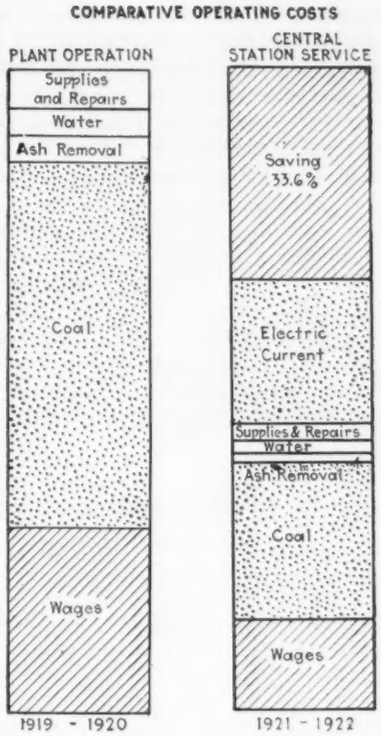
A recent review of the large buildings in the part of this district lying between Twenty-eighth and Fifty-ninth Streets and extending from river to river gave a fairly comprehensive idea of the character of the installations supplied by the Edison company. The largest grouping of important structures comprises 440 loft buildings, some of which reach a height of twenty stories. Of this number 350 are devoted to manufacturing purposes, including printing, and ninety to commercial purposes—salesrooms, offices, etc. Second on the list are the apartment houses, of which there are 275. Next is the office building group, which contains 205 structures, followed by the theaters, of which there are sixty-two. Completing the list are fifty-five hotels, twenty-two motion-picture houses and nine department stores. The electrical installations of the largest of these buildings run up to from 2,000 kw. to 3,000 kw.

A very large proportion of New York's manufacturing is done in buildings of the manufacturing loft type, the units being comparatively small. The census figures show that in 1919 there were in Manhattan and the Bronx 24,382 manufacturing establishments, having an average of 13 hp. per establishment, while the average in a group of other large cities was 90 hp. per establishment.

The foremost industry of the city is garment manufacturing, and this is practically all carried on in these manufacturing loft buildings, nearly all of which use central-station service. Excellent examples of this type of building are the two huge structures of the garment center on Seventh Avenue from Thirty-sixth to Thirty-eighth Street. Here may be found in one service unit a large group of manufacturers of wearing apparel whose combined electrical requirements, including the building equipment, total 2,650 kw.

Second in rank are the printing and publishing trades. With the removal of the New York *Tribune* from its former location in Nassau Street to its new building on West Fortieth Street it became a customer

of The New York Edison Company, which now, with this acquisition, supplies every large newspaper in Manhattan. In general commercial printing and in the publishing of magazines and books central-station service is also predominant. The electrical requirements of these large newspaper and printing buildings, of which there are more than half a hundred in the city, run as high as 2,500 kw.




TYPICAL SAVINGS EFFECTED BY ABANDONING PRIVATE PLANT

In Manhattan building operations during the past few years have been principally in the direction of office, loft and apartment construction, the latter of the more expensive kind. Many of the structures erected in this period will undoubtedly occupy permanent places in the list of New York's prominent buildings. Among them may be mentioned the Cunard Building, at 15-25 Broadway; the Pershing Square Building, Forty-second Street and Park Avenue; the Cotton Exchange, 60-62 Beaver Street; the Standard Oil Building, still in course of erection at Broadway and Beaver Street. All these and very many others are supplied with central-station service.

### PRIVATE PLANTS DISAPPEARING

The private plant, while still a factor in large building service, is becoming less and less so year by year. In the last ten years the number of private plants installed in Manhattan and the Bronx in new buildings has averaged about two yearly. Contrasted with this is the record of twenty years ago, when during 1902 fifty-three private plants were installed in new buildings. This change in the situation is the more significant when it is remembered that the average size of the buildings erected in the city is very much greater now than it was twenty years ago.

Accompanying this decrease in the number of new plants arranged for is the constantly growing number of private plants abandoned in favor of central-station service. The New York Edison Company's records show a total of about eight hundred private generating plants shut down, of which about three hundred have been abandoned in the last five or six years. All sorts and sizes of buildings are represented.

The number of plants abandoned, while composing a fairly formidable list, would unquestionably be much larger were it not that when many of New York's large buildings were erected hydraulic elevators were installed as the best type then available. The owners of these properties are now faced with the necessity, if their generating plants are shut down, of electrifying the elevators or continuing in operation their high-pressure boilers and elevator and pumping equipment, the latter course making it difficult to realize the full measure of saving. While the alternative of installing new electric elevators or electrically operated pumping equipment involves a large initial outlay, the advantages are so pronounced that during recent years several hundred hydraulic or steam elevators have been changed to electric operation, the expenditures for this purpose running into hundreds of thousands of dollars.

In the Bronx district the principal growth during several years past has been along residential lines, the apartment-house construction in that section having broken all previous records by a wide margin. Included in the list are the new Roosevelt Apartments, widely advertised as the largest apartment house in the world. This building covers an entire city block, accommodates 260 families and has a lighting installation of more than five thousand lamps.

The manufacturing load in the Bronx is an important and constantly growing one, central-station service having been adopted not only in virtually all the new factories erected within recent years, but in a large number of older ones as well, which were formerly supplied from private plants.

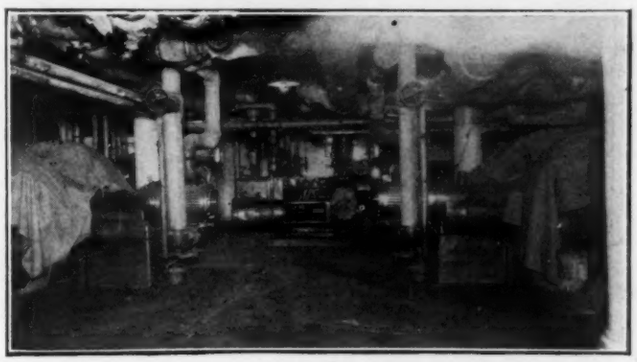
The load of the factory plant business taken over during the past five years totals approximately 12,500 hp. distributed among 130 manufacturing establishments

### THE UNITED ELECTRIC LIGHT & POWER COMPANY

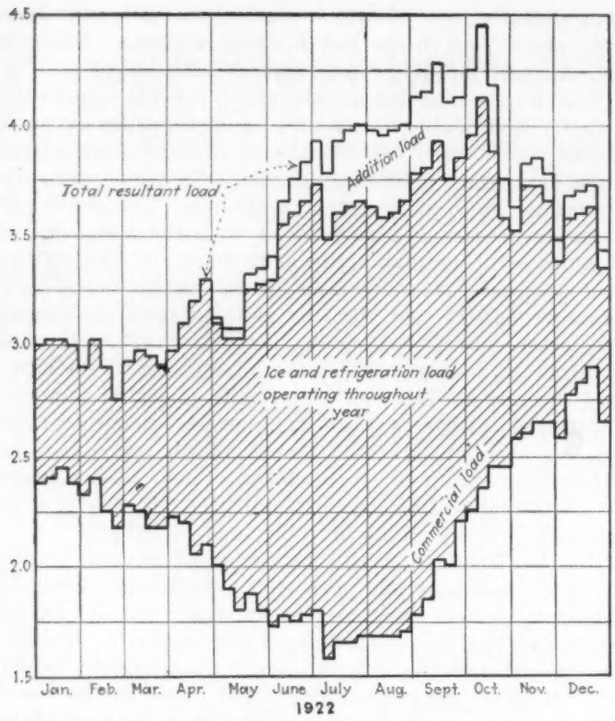
The United Electric Light & Power Company, which produces alternating current only, overlaps the territory of the Edison company and supplies service to the extreme northern end of Manhattan Island. The company wholesales a large amount of high-tension power to other utilities, including The New York Edison Company, and supplies power to the New York, New Haven & Hartford Railroad Company for the operation of its electrified division as far as Cos Cob, Conn. The ice and refrigeration business, because of its desirable load factor, has had especial attention in the sales efforts of the company. The largest ice plant in the world is one of the United company's power customers. The results

TABLE I—UNITED COMPANY'S REFRIGERATION LOAD

| Year | Customers | Added Hp |
|---|---|---|
| 1917 | 0 | 0 |
| 1918 | 18 | 11,425 |
| 1919 | 42 | 10,430 |
| 1920 | 53 | 4,517 |
| 1921 | 62 | 8,485 |
| 1922 | 77 | 9,035 |
| Total | | 43,892 |



OLD PRIVATE PLANT REPLACED BY CENTRAL STATION POWER




HOW THE ICE AND REFRIGERATION LOAD FILLS UP THE VALLEY FOR THE UNITED ELECTRIC LIGHT & POWER COMPANY

as reflected in the connected load of the company's commercial business are shown in the accompanying analysis (Table I), showing the amount of this business added during the last five years.

During the past year special interest has been devoted to contracts for the manufacture of ice cream, one of the components of the ice and refrigeration business. In this period of twelve months 1,300 kw., representing a gross revenue to the company of $39,000, was added to the company's lines through this medium.

### Ice and Refrigeration Business Big Item in 1922

The high-tension ice and refrigeration business for 1922, as represented by twenty-seven plants supplied by the company, totaled an annual consumption of 73,804,520 kw.-hr. in commercial load.

The figures presented above apply only to the Borough of Manhattan and are exclusive of power supplied to allied organizations. The annual load factor of the high-tension ice and refrigeration business is 55 per cent as against the load factor of the entire commercial low-tension business of only 33.8 per cent. The average weekly load factor for all high-tension ice and refrigeration business for 1922 was 80 per cent. How the company's commercial power load is divided is shown in Table II. Service to large apartment houses makes up no mean portion of the United company's load and is increasing rapidly each year.

TABLE II—CLASSIFICATION OF COMMERCIAL POWER LOADS ON UNITED ELECTRIC LIGHT & POWER COMPANY'S LINES

| Kind of Load | Per Cent of Total |
|---|---|
| Ice and refrigeration | 59.0 |
| Woodworking | 8.3 |
| Provisions | 3.2 |
| Metals and furnaces | 8.8 |
| Tobacco, chemicals and laundry | 5.7 |
| Construction work (temporary) | 6.0 |
| Telephone exchanges | 3.7 |
| Glass and marble | 0.3 |
| Miscellaneous | 5.0 |
| Total | 100.00 |

Further extension of the power business in New York is now being developed through increasing the means of utilization of electrical energy by existing customers. In this respect vulcanizing and small heating applications, the use of glue pots, soldering irons, individual ventilating fans and small refrigerating plants offer an almost unlimited field. To develop this business The New York Edison Company has recently adopted a policy of selling this equipment to its customers, at the same time offering them the opportunity to pay for it on the deferred-payment basis.

### Brooklyn Edison Company

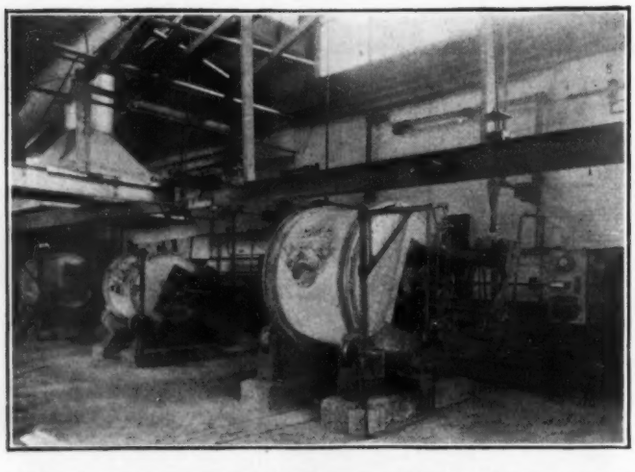
The Brooklyn Edison Company maintains a commercial engineering bureau which handles all power in excess of 10 hp. It compiles data regarding the development of large commercial installations and follows up the erection and equipment of all new buildings in the borough, maintains a "follow-up" of all existing customers by periodic calls, develops additional consumption of existing large customers, tests independent private plants, prepares engineers' reports, and follows up the development of federal, state and city public works and general large installation plans.

During the year many private steam generating plants and steam and gas engines were replaced by Edison service. A number of large original contracts were obtained, the principal ones being: Gowanus Canal Terminal, 3,000 hp., and Williamsburg Bridge municipal trolley line, 2,250 hp.

### Long Island and New Jersey

The New York & Queens Electric Light & Power Company is building up a substantial power load in the plants of manufacturers whose operations require more space than is available on Manhattan Island. Here the typical industrial equipment is found, and one of the recent installations shown here is a battery of three brass melting furnaces in the plant of the Neptune Meter Company.

In New Jersey the Public Service Electric Company has a wide diversity of power business and during the war played an important part in supplying power to shipyards, munition plants and other war industries. Among the large customers of the company is the Crucible Steel Company, which has a demand of 15,000



BATTERY OF THREE BRASS MELTING FURNACES ON THE LINES OF THE NEW YORK & QUEENS ELECTRIC LIGHT & POWER COMPANY

kw. There are many other large manufacturers among the company's power customers. So great has been the demand for power that the company is now installing three 33,000-kva. generators in its Essex station, two of which are to be in operation this year and the third early in 1924. The Public Service Electric Company also has perfected plans for another entirely new plant, the initial capacity of which will be 200,000 kw., with provision for expansion to 400,000 kw.

The magnitude of the use of energy in the metropolitan district becomes apparent when it is considered that in December, 1922, the five central-station companies had a combined peak demand of 947,150 kw. and their total output for the year was 3,254,675,938 kw.-hr. This is exclusive of the energy generated in the plants of the street railways, elevated and subway companies.

## House Wiring and New Homes Add 130,000 Customers

WITH the number of apartment houses increasing and the private homes decreasing each year, particularly on Manhattan Island and in the Bronx, the field for wiring old houses in New York is in a measure restricted. It must also be remembered that in a number of apartment houses energy is sold through one meter to the landlord, who sells to the tenants through his own meters. Such residential customers do not show on the companies' books. The central stations, however, have been very active in offering easy terms to owners of unwired houses.

The New York Edison Company and the United Electric Light & Power Company have been making extensive surveys on their lines and have taken a number of wiring contracts on the deferred-payment plan. These companies do no wiring themselves, but contract with the customer for the business, which is turned over to the electrical contractor.

The Brooklyn Edison Company last October conducted a special house-wiring campaign in which the company financed wiring accounts on easy payments and supplied the contractors with forms for handling the business. The terms offered were 15 per cent down and ten months to pay the balance. A 5 per cent discount was allowed for cash on completion of the work. About 20 per cent of the business taken was on a cash basis.

In Queens Borough the New York & Queens Electric Light & Power Company is making an active canvass of the entire territory and turning this business over to the contractors. The company has not adopted any deferred-payment plan, but during 1922 6,688 old houses were wired and connected to the company's line.

The Public Service Electric Company some time ago retired from the active solicitation of house wiring in order that more attention could be given to the sale of electrical merchandising and current-consuming devices.

During the year 1922 the four companies operating in Manhattan, Brooklyn and Queens Borough, Long Island, connected to their lines 130,000 new residential customers, divided approximately as follows: Brooklyn, 63,000; Manhattan and the Bronx, 35,000, and Queens Borough, 32,000. These new customers, if they were taken together, would make a city of 600,000 people, and, estimated at a cost for wiring of $100 per customer, they represent $13,000,000 of wiring business alone in Greater New York.

## Letters from Our Readers

**A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute**

### Careless Advice from Power Companies on Equipment

*To the Editors of the* ELECTRICAL WORLD:

Although we are not actually a part of the electrical industry, we have, in a way, a more or less indirect interest in a matter in which we believe there is considerable room for improvement in that industry. We manufacture a line of small air compressors sold to the garage trade, filling stations, small manufacturing plants, air-brush painters, users of pneumatic water systems and customers of a similar sort. These customers must buy power to operate their outfit. In sending us the order the customer often fails to specify the current characteristics or gives current characteristics which we are satisfied are not proper, and we tell him to consult his power company as to what current will be available for this size and type of motor. The customer secures this information from the power company, passes it on to us, and we furnish the motor accordingly. Then in a great many cases, entirely too many, we find that the power company has not given the correct information, or did not investigate the situation carefully enough for its prospective customer, or simply "shot up in the air" in the matter, so that, as a result, the customer has to exchange his motor for another one.

The writer has on his desk today papers concerning two cases of this kind. One of these is in Ohio, where the power company advised the prospective customer (its customer as well as ours) that he could install a ½-hp., three-phase motor to drive his air compressor, and then, after he had bought such a motor, told him that he would have to send it back and get a single-phase motor, because there was only a single-phase line available at that point. Another case occurred in Texas, where the same situation arose. Now, ½-hp., three-phase, 110-volt motors are not very good stock, and we are not interested in taking them back, which we would have to do in exchanging single-phase motors for them. In another case just the other day in Michigan the same circumstances arose and the power company, in the language of our jobber and our customer, was very "hard-boiled" about the matter. It didn't seem to care that it had given the customer the incorrect information.

We think the power companies ought to give their prospective customers just as much courtesy and attention and make as much effort to give them correct information as a manufacturer who is trying to sell this same customer a piece of equipment. We do not see that simply because the company is a public utility, with no competition, instead of a manufacturer, there should be any less reason for courtesy and correct information. Such a basic idea is all wrong.

We should appreciate it if the ELECTRICAL WORLD would start the ball rolling and preach the gospel of a little more attention from the new-business departments of these power companies to the prospective customer who is looking for information.

Curtis Pneumatic Machinery Company, St. Louis, Mo.

WALTER C. HECKER,
Vice-President and Sales Manager.

# Central Station and Industrial Practice

**Installation, Operation, Maintenance, Test and Repair of Generation and Distribution Equipment, and Methods of Economically Utilizing Electric Service in Large Industrial Plants**

## Effect of $CO_2$ Variation on Boiler Efficiency*

TO STUDY what effect variation of the $CO_2$ content of flue gases has on superheat some tests were conducted in which the flue-gas losses were calculated from the test data and the other losses determined by averaging a number of heat balances of evaporative tests conducted on the boiler. The loss due to "steam formed by burning hydrogen" was taken at 5.84 per cent and the loss due to "unconsumed hydrogen, radiation and unaccounted for" as 6 per cent.

These observations were made in an oil-fired 6,000-sq. ft. Babcock & Wilcox boiler with a double-deck Babcock & Wilcox superheater. The arrangement of the furnace was of the conventional "back shot" type with standard baffling.

The variation in $CO_2$ was procured by first obtaining the desired rating with good combustion, burners being carefully adjusted to get uniform flame from each, and then increasing the amount of draft, thereby lowering the $CO_2$, all other conditions remaining constant. In this manner good combustion was obtained throughout the test, the decrease in $CO_2$ being due to excess air only.

Steam temperature was measured with a chemical thermometer in a well with a mercury bath scaled for 3-in. immersion. Rating was determined by a flow meter permanently connected to boiler; $CO_2$, CO and O were determined with standard Orsat apparatus. There was no CO present in any of the tests made. All gages, meters, etc., were carefully calibrated and checked for accuracy before test. The steam pressure during the test averaged 210 lb. per square inch with the barometer 29.7 in.

Fig. 1 was constructed from the test data. The curves as drawn and marked for 75 per cent, 125 per cent and 175 per cent ratings are not, strictly speaking, constant-rating curves, but represent only the ratings at which it was endeavored to operate. $CO_2$ curves were constructed as shown in Fig. 2 from the average values given in Fig. 1 and show the amount of superheat to be expected with variations of $CO_2$. A further series of observations was made to obtain data from which heat balances could be calculated to give the efficiency curves shown in Fig. 2. Fig. 2 can be read in several different ways. It provides a means of determining whether the increase in superheat due to low $CO_2$ and poor combustion, which is partly overcome by the increase in efficiency of machines using the steam, is justified.

For an example, assume a boiler rating of 145 per cent and 14 per cent $CO_2$. With these conditions the chart shows the efficiency to be 80 per cent. By lowering the $CO_2$ to approximately 12.8 per cent the boiler efficiency is lowered 1 per cent and the superheat is increased 9 deg. F. An increase of 12 deg. F. superheat effects a 1 per cent saving on a modern steam turbine. This would indicate that the high $CO_2$ has an advantage over the high superheat by one-quarter of 1 per cent. Taking a wider range and reducing the $CO_2$ from 14 per cent to 10 per cent, the boiler efficiency falls off 3.5 per cent and the superheat is increased 43

*Abstract of paper presented at the Southwest Geographic Division, N. E. L. A., convention at Oklahoma City, Okla., March 14-16, 1923.

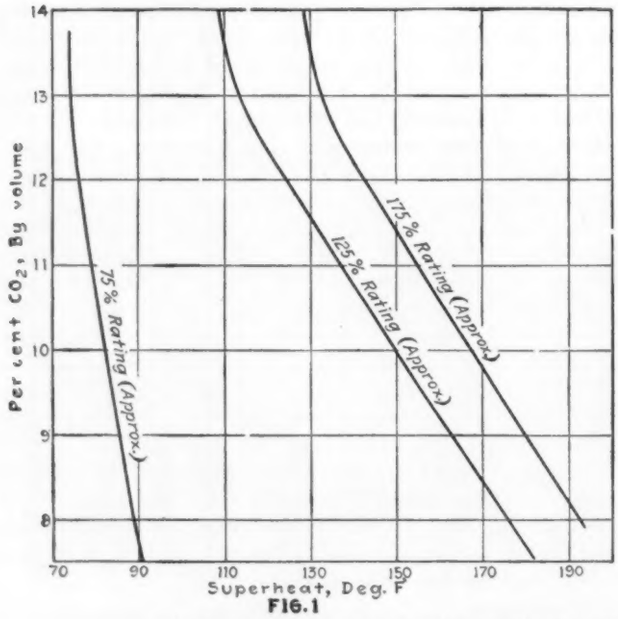


FIG. 1

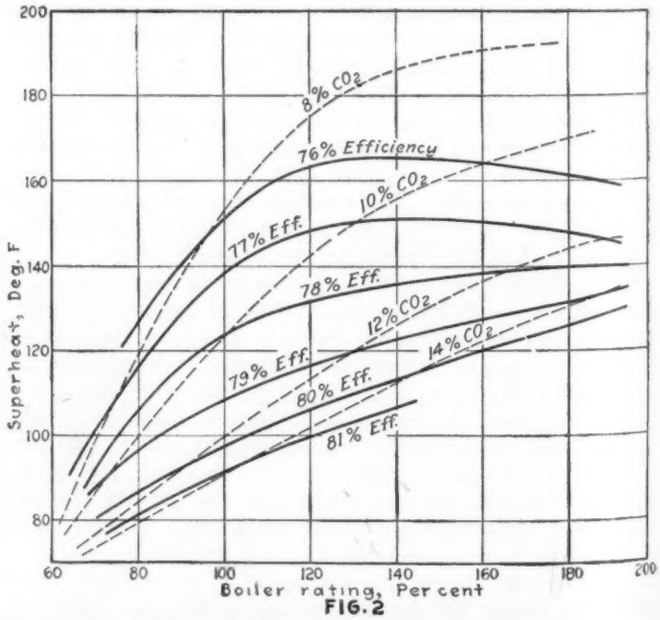


FIG. 2

FIG. 1—SUPERHEAT AND $CO_2$ RELATION AT VARIOUS RATINGS OF BOILER. FIG. 2—RELATION BETWEEN SUPERHEAT, $CO_2$ AND EFFICIENCY AT VARIOUS RATINGS

deg. F., which is equivalent to increased turbine efficiency of 3.5 per cent. This shows the loss in boiler efficiency to be exactly equal to the increased efficiency of the turbine effected by a higher superheat at this point.

The gain in efficiency due to high superheat is not so reliable as that obtained with good combustion in the boiler and high $CO_2$. Turbines will not produce this 1 per cent saving on light or heavy loads, and it is doubtful how many of them will produce it under normal load. Therefore, as such an extreme drop in the $CO_2$ is required to equal or surpass the saving due to high superheat, it is concluded that it would be advisable to maintain the maximum $CO_2$, keep the superheaters clean and let the superheat come where it will.

W. P. CREWS.

## Interruptions to Service Classified as to Cause

FOR the purpose of making a study of the causes of interruptions to service on its transmission and distribution lines and in its substations, the Southern California Edison Company makes out a monthly report classifying interruptions with respect to cause and to voltage of the line on which the trouble occurred. The report for the month of December, 1922, is shown herewith. The use of such a summary is of considerable value in analyzing the sources of trouble which cause interruptions on the system in order that steps may be taken to cut down these failures. The report is prepared by the load dispatcher from his operating records, and copies are sent to the manager of operation and the protection engineer.

A word of explanation in connection with the report will make the nature of the trouble covered by some of the classifications clear. "Unknown" covers such conditions as where a switch on a transmission or distribution line "kicks out" and can be reclosed by hand with no repetition of the trouble, or where no evidence of a flashover can be found by a patrolman after going over the line. "Failure of low-tension oil switch to open, kicking out high-tension switch," covers cases where an oil switch of the voltage indicated fails to open and causes other switches to operate. "Trouble on foreign lines" refers to cases of trouble communicated to the company's system through interconnections with other power systems or to trouble arising on railway lines or distribution systems of municipalities supplied by the Edison company. The number of interruptions from insulator failures, as shown by the report, indicates that troubles from this cause are by no means confined to high-voltage lines on this system.

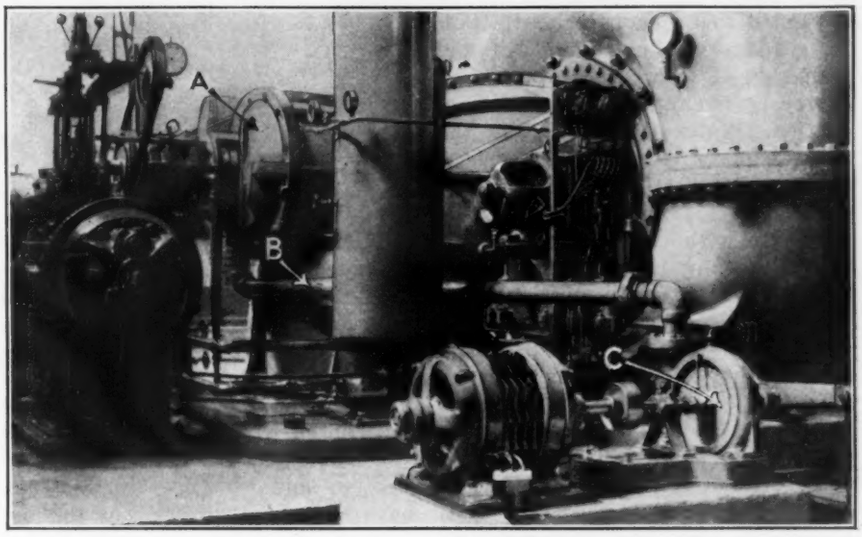
H. W. NEIR,
Chief Load Dispatcher.
E. R. STAUFFACHER,
Protection Engineer.
Southern California Edison Company,
Los Angeles, Cal.

TRANSMISSION-LINE INTERRUPTIONS CLASSIFIED WITH RESPECT TO CAUSE AND VOLTAGE OF LINES

| Cause of Trouble | Number of Interruptions Voltage of Lines in Kv. 10 | 15 | 30 | 50 | 60 | 150 |
|---|---|---|---|---|---|---|
| Unknown | 38 | 8 | .. | 2 | 6 | .. |
| Fires | .. | .. | .. | .. | .. | .. |
| Insulator failure | 10 | 6 | 2 | 2 | 3 | .. |
| Lightning | .. | .. | .. | .. | .. | .. |
| Flashovers | .. | .. | .. | .. | 5 | 2 |
| Accidents | .. | .. | .. | .. | .. | .. |
| Mistake in switching | .. | 3 | .. | .. | .. | .. |
| Oil-switch failure | .. | 2 | .. | .. | .. | .. |
| Failure of low-tension oil-switch to open, kicking out high-tension switch | 9 | .. | .. | .. | .. | .. |
| Switch trouble (mechanical) | 1 | .. | .. | .. | .. | .. |
| Switch trouble (control) | .. | .. | .. | .. | .. | .. |
| Pole broken by auto | 2 | 2 | .. | .. | 1 | .. |
| Pole raised into line | .. | .. | .. | .. | .. | .. |
| Pole burned off | 3 | 2 | .. | .. | .. | .. |
| Pole blown over | .. | .. | .. | .. | .. | .. |
| Wires blown together | .. | .. | .. | .. | .. | .. |
| Tree in line | 1 | 1 | .. | .. | .. | .. |
| Trouble on foreign lines | .. | 7 | .. | .. | 2 | .. |
| Birds | .. | .. | .. | .. | 3 | .. |
| Airplane hit line | .. | .. | .. | .. | .. | .. |
| Fuse holder grounded | .. | .. | .. | .. | .. | .. |
| Failure of consumer's transformer | 3 | 1 | .. | .. | .. | .. |
| Shorted by lineman | 1 | .. | .. | .. | .. | .. |
| Shorted by telephone line | .. | .. | .. | .. | .. | 1 |
| Shorted by house movers | 1 | .. | .. | .. | .. | .. |
| Circuit closed out of phase | 2 | .. | .. | .. | .. | .. |
| Lead melted out of lug | .. | 1 | .. | .. | .. | .. |
| Pothead failure | .. | 1 | .. | .. | .. | .. |
| Cable failure | .. | .. | .. | .. | .. | .. |
| Arrester trouble | 1 | .. | .. | .. | .. | .. |
| Jumper loop burned off | .. | 1 | .. | .. | 1 | .. |
| Total | 72 | 35 | 2 | 4 | 21 | 3 |

## Auxiliary Pump on Turbine Counteracts End Thrust

THE end thrust of horizontal single-discharge reaction turbines is toward the draft-tube side and is generally counteracted by some type of balancing piston. On a 2,000-hp. unit provided with a hydraulic thrust piston and renewable bronze wear rings it was found that the rings had to be renewed quite frequently when the machine was operated under full load for any length of time. This thrust piston is placed where the shaft leaves the draft tube, and the piston chambers were orginally supplied by a pipe direct from the turbine casing. There was thus the full turbine pressure on one side of the piston against the draft-tube vacuum on the other, tending to counteract the end thrust.




RING REPLACEMENTS ON REACTION TURBINE DECREASED BY INCREASING PRESSURE IN HYDRAULIC THRUST PISTON

To prevent the rapid wear of the renewable rings on the thrust piston, a small centrifugal pump was introduced into the pipe line from the turbine to the piston. This raised the pressure in the piston about 5 per cent above the turbine pressure, with the result that the turbine could be operated satisfactorily at full load and with no appreciable ring wear at the piston.

The arrangement that solved this difficulty is shown in the accompanying illustration, in which *A* is the hydraulic thrust position, *B* the pressure piping and *C* the centrifugal pump driven by a 10-hp. motor and connected by a flexible coupling.

FREDERICK KRUG,
Superintendent of Hydro-Electric Plants.
Porto Rico Railway, Light & Power Co.,
Bayamon, Porto Rico.

# Extracts from an Operating Code

BY FIELD EDITOR ELECTRICAL WORLD

New York, N. Y.

## Instructions for Operating Evaporators

EVAPORATORS, by vaporizing and condensing raw river water, remove from the make-up water of a station all mud and foreign matter, which, if allowed to enter the boiler, would cause excessive scale formation on the tubes. It is not advisable to use superheated steam in evaporators on account of the priming of the first-effect shell caused by too rapid boiling or evaporation. Water is admitted to the live steam to reduce the superheat to zero or to saturated steam temperature.

The coils should be covered with water, as any portion of the coil being uncovered will not only reduce the capacity of the evaporator but will have the scale baked on it so hard that it cannot be removed by the usual "cracking down" process. When an evaporator is taken out of service, the coils should be covered with water to prevent the scale from drying on the coils. It is important that the high-pressure and low-pressure traps be properly vented since steam contains more or less air and non-condensable gases. Furthermore, if not vented, the coils will fill up with air, which will reduce the capacity. The following rules for putting an evaporator into service and for taking it out are part of the operating code of the Philadelphia Electric Company.

PUTTING AN EVAPORATOR INTO SERVICE

1. See that water supply lines and exhaust steam lines to the evaporator heater are in operating condition.
2. Start the evaporator feed pumps.
3. See that all blow-down valves are closed and that the vent on each shell is open.
4. Fill each shell to the running water level as indicated by the mark on the shell.
5. Open the vents on the traps on both high-pressure and low-pressure coils.
6. Open wide the vapor valve on the first effect.
7. Open the vapor valve on the second effect.
8. Open slowly the high-pressure steam valve to the first-effect coils, noting that the reducing valve maintains 200 lb. gage pressure.
9. Maintain 388 deg. steam temperature by adjusting the boiler-feed supply to the desuperheater.
10. See that the trap is functioning on the steam separator.
11. Close the vents on the shells when the steam appears.
12. Slowly build up pressure in the shell of the first effect to 57 lb. by increasing the live steam to the coils of the first effect until 200 lb. at 388 deg. F. is maintained at the entrance of the coils.

TAKING AN EVAPORATOR OUT OF SERVICE

1. Close the high-pressure steam valve to the first-effect coils.
2. Close the water line to the desuperheater.
3. See that the float valves shut off the water after evaporation stops.
4. Close the vapor valve on the second-effect shell.
5. Shut down the evaporator feed pump.

## Starting and Stopping Small Motors on Auxiliaries

CONTINUITY of service depends upon having all equipment ready for immediate service, and definite instructions for operating apparatus will very often prevent interruptions caused by carelessness. The following instructions for starting and shutting down small motors, while not complicated, should always be kept in mind by operators. They have been abstracted from the operating code of the Philadelphia Electric Company.

SYNCHRONOUS MOTORS—STARTING

1. Close the starting switch and note that the rotor turns over.
2. After the motor comes up to maximum speed on the starting switch, open the starting switch and immediately close the running switch.
3. After the motor comes up to maximum speed on the running switch, see that all the field resistance is cut in, close the field switch and adjust the field for the maximum armature current.

SHUTTING DOWN

1. Open the running switch.
2. Cut all field resistance in.
3. Open the field switch.

INDUCTION MOTORS STARTED BY COMPENSATOR—STARTING

1. See that the compensator handle is in the "off" position.
2. Close the motor main switch.
3. Throw the compensator handle to the starting position and note that the rotor turns over.
4. When the motor comes up to maximum speed on the starting position, throw the compensator handle to the running position.

SHUTTING DOWN

1. Open the motor main switch.
2. Return the compensator handle to the "off" position if it does not return automatically.

MOTORS STARTED FROM AUTOMATIC CONTROL PANEL—STARTING

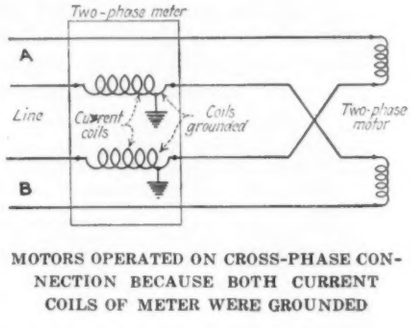
1. See that the controller is in the "off" position.
2. Close the motor main switch, if it is not already closed.
3. Throw the controller handle to the required running position.
4. Note that the motor comes up to the required speed.

SHUTTING DOWN

1. Throw the controller handle to the "off" position.
2. Open the motor main switch, unless other motors are fed by this switch.

## An Interesting Case of Two-Phase Meter Trouble

WHEN a two-phase meter supplying about 40 hp. of motors was tested in place the meter was found to be slow and did not respond to the usual adjustment. The tester arranged for a shutdown during the noon hour to replace the meter. After replacement the motors were tried and only one would start, the remainder appearing to receive single-phase current only. The new meter was removed and the meter loop connected through solidly. The single-phase condition still existed,




MOTORS OPERATED ON CROSS-PHASE CONNECTION BECAUSE BOTH CURRENT COILS OF METER WERE GROUNDED

although a lamp test showed both phases normal. The old meter was then replaced and all motors operated satisfactorily.

A later investigation disclosed the fact that both current windings of the old meter were solidly grounded to the case near the outlet, making one wire of each phase common. All but one of the motors were connected cross-phase, so that operation was possible only when the two wires passing through the current elements of the meter were tied together. Presumably the meter failure occurred prior to a recent rearrangement of motor wiring, and the electrican simply connected each phase of the motors across any pair of wires that had a difference of potential of 220 volts. This experience demonstrates the care that must be exercised when installing any equipment.

T. W. SNELL.
General Superintendent.
Coast Valleys Gas & Electric Company.
Salinas, Cal.

## Service Quickly Restored by Portable Substation

TO MINIMIZE the period of outage resulting from failures of power transformer installations on 6,600/2,200-volt lines and the expense of restoring service, especially when these emergency conditions occur after working hours, the Dayton (Ohio) Power & Light Company utilizes a portable transformer substation which can be hauled out to a job and placed in operation in a very short time. The use of this portable substation has enabled the company to change transformer banks up to 150-kva. capacity, replace bad transformers on existing banks and replace bad poles or timbers on transformer structures without interrupting the service to the customer. It is also useful for supplying power for temporary jobs of short duration where it is not deemed necessary to install a permanent structure.

The portable substation consists of three 50-kva., single-phase, 6,600/2,200-volt transformers banked in closed delta and mounted on a two-wheeled rubber-tired trailer. A definite idea of the substation may be obtained from the detailed plans and the illustrations shown herewith. The trailer is equipped with a rigid prop on the rear end and an adjustable prop on the front end which permits it to be maintained perfectly level when stationary, the weight of the transformers being so distributed that the entire structure is almost balanced. Each of the transformers is bolted to the substructure of the trailer by means of long through bolts extending down from the lid of the transformers, thus keeping them rigid at all times.

The transformers are completely housed in on all sides with a wooden housing extending from the bottom up to a point approximately 8 in. above the top of the transformers. This housing completely hides the transformers from view and also prevents any one standing on the ground from coming into contact with any of the primary or secondary leads.

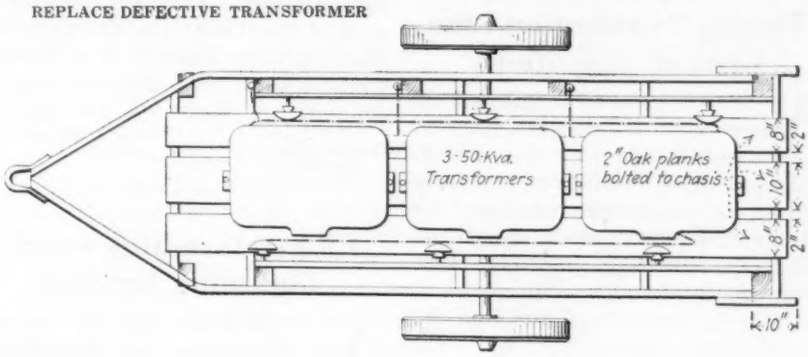
The incoming primary leads are supported on three 4-in. x 4-in. uprights spaced approximately 2½ ft. apart, which extend 15 ft. above the ground level and are fastened to the primary side of the transformer housing. The primary cut-outs are mounted on these uprights about 12 in. from the top and are so arranged as to be easily accessible.

PORTABLE SUBSTATION CURTAILS EXPENSE OF WORKING LINEMEN OVERTIME TO REPLACE DEFECTIVE TRANSFORMER

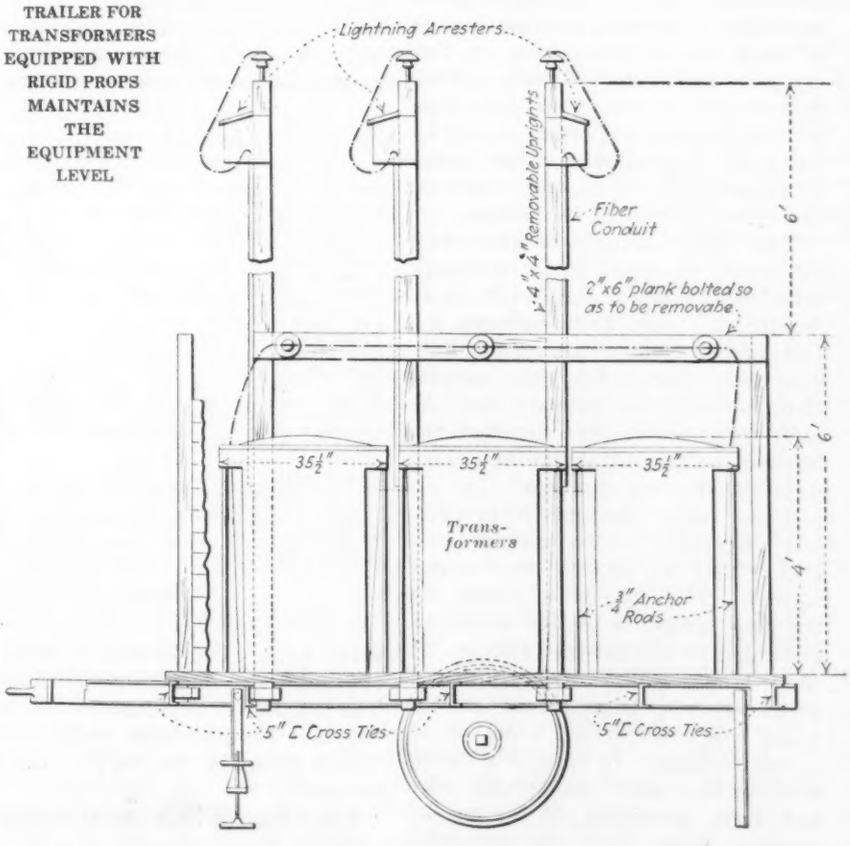
A 5-kva. compensator has been installed and can be connected up to the secondary side of the transformer bank so as to supply 115-volt service for lighting if necessary. This compensator is only used when the transformer bank being changed is connected 230 volts on the secondary side and when the lighting is also supplied by the same transformers.

In keeping with the safety first policy of the company to warn the public of the proximity of high-tension wires, prominent danger signs are attached to the housing of the portable substation and are so placed as to be clearly legible and easily noticeable.

The use of the portable substation has enabled the company to cut down




TRAILER FOR TRANSFORMERS EQUIPPED WITH RIGID PROPS MAINTAINS THE EQUIPMENT LEVEL



the length of outages due to transformer failures during electric storms to a minimum and has also curtailed the expense of working its linemen overtime in order to replace defective transformers.

The company is contemplating a few changes in the design of the substation, however, one of the principal ones being the replacing of the two-wheel trailer with a four-wheel trailer. It has been found almost impossible in some instances to haul the substation right up to the source of trouble by means of a truck, and the four-wheel feature will permit the trailer to be pushed to the necessary location without the danger of upsetting the structure.

FIELD EDITOR ELECTRICAL WORLD.
Chicago, Ill.

## Testing Distribution-Line Ground Conditions

AS MOST companies ground all secondary distribution lines at the customers' services it is essential to have a rapid and accurate check to determine whether the proper wire is grounded. Very often when an operating company takes over small systems and connects them to its lines it is found that the distribution secondaries are not grounded. The writer had occasion to check the grounding conditions in a small system taken over by this company and wished to make a check that was rapid and at the same time accurate. This was accomplished by using the simple device of two lamps in series, with means of grounding the wire between the two lamps.

Two weatherproof sockets were connected in series to an ordinary attachment plug, and a lead 20 ft. in length was taken from between the two lamps. The writer and a lineman then started from the substation, following the primary line. As each transformer was reached the lineman would obtain the necessary data by climbing the pole. The attachment plug was then inserted in any lamp socket in the nearest house taking service from the transformer. Then the wire connecting the two lamps in series would be grounded at the nearest source. If the transformer was properly grounded, one lamp would go out while the other would come up to normal voltage. In case of a three-wire service where an outside wire had been grounded by error, all services taken from the grounded side and the neutral would test as above, while a service taken from the neutral and ungrounded side would show double voltage to ground. In case of three-wire services care was taken to get a test from services taken from each outside-line wire and neutral.

When the transformer was not grounded at all, the two lights would burn at half voltage and no change in brilliancy would be made when grounding the test lead. In the case of several transformers that had been grounded to pipes there was a slight dimming of one light while the other would brighten to a small degree, showing that the grounding was insufficient.

Forty transformers were tested in one day, and it was found that less than one-half of them were grounded satisfactorily. Four had an outside wire of the three-wire, 220-volt service grounded, instead of a neutral, while others were entirely clear of grounds.

MERTON L. TAYLOR,
Meter Department.
Central Maine Power Company,
Augusta, Me.

## Cost of Installing Single Lightning Arrester

AN ITEMIZED table of the cost of purchasing and installing a single 1,000-3,000-volt lightning arrester in a substation about two miles from the generating plant of a Massachusetts central station is given here. The labor and material charges were almost equally divided. The tabulation is suggestive because of the completeness with which minor items in the supply line are covered.

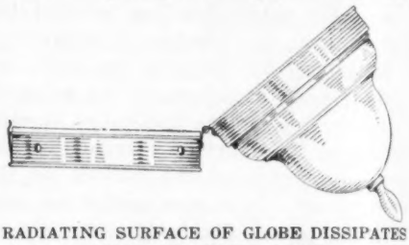
INSTALLATION COST OF LIGHTNING ARRESTER

| | |
|---|---|
| One 1,000/3,000-volt lightning arrester, complete | $397.00 |
| Freight | 7.99 |
| Angle iron | 13.40 |
| Channel iron | 2.60 |
| Paint, 3 gal., at $2.54 | 7.62 |
| Pipe, bushings, etc. | 1.33 |
| Fifty-four machine bolts, assorted. | 0.85 |
| Four rolls tape, at $0.61 | 2.44 |
| One 5-gal. can "Justrite" | 8.50 |
| Gasoline, 18 gal. | 4.60 |
| No. 227 compound | 1.22 |
| Waste | 0.59 |
| Expansion screws, ½-in. | 0.79 |
| Carriage bolts | 0.20 |
| No. 4/0 copper sleeves | 0.52 |
| String solder | 1.36 |
| Solder paste | 0.10 |
| No. 2 stranded bare wire | 1.07 |
| One weatherproof socket | 0.23 |
| Two rolls "Marlin," at $0.345 | 0.69 |
| Lag screws | 0.18 |
| Payroll, labor | 426.34 |
| Total | $879.62 |

FIELD EDITOR ELECTRICAL WORLD.
Boston, Mass.

## Modified Ventilators for Street Lamps

THE question of just how much ventilation is necessary for the economical operation of single-light units of 400 cp. to 600 cp. for street lighting has been the subject of considerable discussion, and perhaps a statement of the experience of the writer will be of interest. The first trouble was experienced after the initial installation of forty 400-cp., 6.6-amp. single-light standards made about eight years ago, using the



RADIATING SURFACE OF GLOBE DISSIPATES HEAT OF STREET LAMP

Macbeth-Evans Monax globes and copper ventilator, which is similar in design with all others, the hot air being expelled at the top through small holes under a protecting cap. In the north country we have some severe snowstorms accompanied by high winds, and we found that after such a storm, occurring in the daytime, the snow would enter through the ventilator and lodge on the top of the lamp. When the current was turned on to the circuit the lamps would explode one after another.

Investigation finally brought the remedy. All of the ventilators were brought into the shop and a circular piece of tin was soldered into them just where the top of the globe came. This tin was then covered with a heavy piece of cloth so that when put on the globe and screwed down all ventilation through it was cut off. We operated forty of the posts through one entire winter without a failure due to snow, and as fast as we installed posts thereafter we used the same method until last year, when the writer designed a "ventilator," or helmet which does not ventilate. We are now operating 170 400-cp., 6.6-amp. single-post lamps equipped as stated above and have had no failures due to snow entering globes. Tests have shown that the globe has radiating surface enough to take care of the heat generated by the lamp, our record being two and one-half renewals per post per year, burning 4,000 hours.

S. G. HUNTER,
Operating Manager.
Malone Light & Power Company,
Malone, N. Y.

# Central Station Business

Advertising, Selling and Service Methods
Commercial Organization and Management, Customer and Trade Relations, Public and Financial Policies, and Reports of Company Plans and Experiences

## Why Public Utilities Should Advertise

### Of Three Billion Dollars Gross Income the Four Major Utilities Spend but One-fourth of 1 per Cent for Advertising, Whereas They Should Appropriate $60,000,000 Annually

By W. P. Strandborg
President Public Utilities Advertising Association, Portland, Ore.

IN A GREAT many public utility companies the underlying reason why the executives have not been "sold" on the idea of the value of advertising is because their training, experience and habitual viewpoint have not brought advertising clearly above their horizon. If they have glimpsed its meaning at all, it has generally been that it deals with intangibles to a greater or less degree —and intangibles are something that technical engineers, lawyers and unimaginative operatives and managers have had little sympathy with or understanding of.

But once these executives have been "shown" what advertising has done and can do, when given an honest and thorough test, a great majority of them give it the recognition its importance deserves.

The writer has come in contact with many such cases, and that is why he has set down a few of the reasons why public utilities should advertise—so that our members, if they feel that their own companies are not giving the proper prominence to advertising, may use some of these suggestions as the basis for "selling the idea to the boss."

Public utilities should advertise because:

1. We have a seventeen-billion-dollar investment to protect.

2. This gigantic investment is subject to attack and harassment by all sorts of regulatory and legislative bodies, by the general public and the newspapers to a greater extent than any other large and legitimate business in the country.

3. We do $3,000,000,000 worth of business a year, and because intelligent advertising will stimulate it to greater growth.

4. We are far in the rear of every other modern business in advertising.

5. We need the greater good will of our 33,000,000 customers.

6. Our business comes into more intimate daily contact with more people than any other line of business in the world.

7. Our business, which is so essential to the comfort and well-being of the people, is highly technical, and the public does not understand it.

8. Our problems are the problems of the people, and we need their sympathetic understanding and support.

9. The people will be fair when they do understand all the facts, and systematic advertising is the most effective way to tell our story and give the people the facts.

10. Our exclusive business is salesmanship in its broadest application, and every form of salesmanship needs the fifty-fifty push and punch of advertising.

11. The selling of public service—essential and indispensable public service, if you please—is known, by experience and test, to respond as rapidly and in as great a measure to judicious advertising as the selling of any legitimate merchandisable commodity.

12. Many of our companies sell securities just exactly as investment houses do, and where would investment houses be if they didn't advertise?

13. Many of our companies sell merchandise exactly as department stores and specialty shops do—institutions whose advertising appropriations average from 2 to 7 or more per cent of their gross each year.

14. The demand for any worthy product—service, security or commodity—can be created and stimulated by means of advertising.

15. The greater the demand for any product, the less will be the ratio of production cost, with proportionately greater economy of operation.

16. It is the specific function of advertising to create consumer demand and consumer preference.

17. Truthful, sincere, interesting and believable advertising is a recognized asset in modern business.

18. Advertising will bring the full benefits of the merit of our product.

19. Advertising is the most inexpensive motive power that our industry or any industry can buy today.

20. The great "buyers' strike" following the world war proved that more and better advertising meant more and better business and more and better good will.

21. The place of advertising in the present economic system is thoroughly well established.

22. Business exists, in the last analysis, in the minds of its customers.

23. While you may supply the actual needs of the public without advertising, the actual needs are but a fraction of the demand that can be created, and advertising is a prime mover in creating this demand.

24. Public utility commissions in many states have recognized advertising as a legitimate operating expense, both in the creation of good will and in business building, thereby nullifying the somewhat widespread popular criticism that advertising by public utilities is a needless extravagance.

25. A public utility that advertises consistently finds it easier to finance its requirements than one which does not advertise. Bankers generally look upon a good advertiser as a good borrower, and prospective borrowers are frequently asked, "What is your advertising appropriation?"

26. Experience shows that public utilities which have adopted definite advertising programs on a budget basis have never abandoned this policy, but, on the other hand, have shown a tendency to expand their advertising appropriations year by year.

27. Advertising, properly used, will increase the turnover for utilities just as it does in other lines of business.

This list of "becauses" is by no means complete. It could probably be elaborated to twice the number given, and even among some of those set down there is some overlapping, yet the main thought is to show public utility companies that they have an abundant reason for giving advertising a fair trial and little, if any, reason for not doing so.

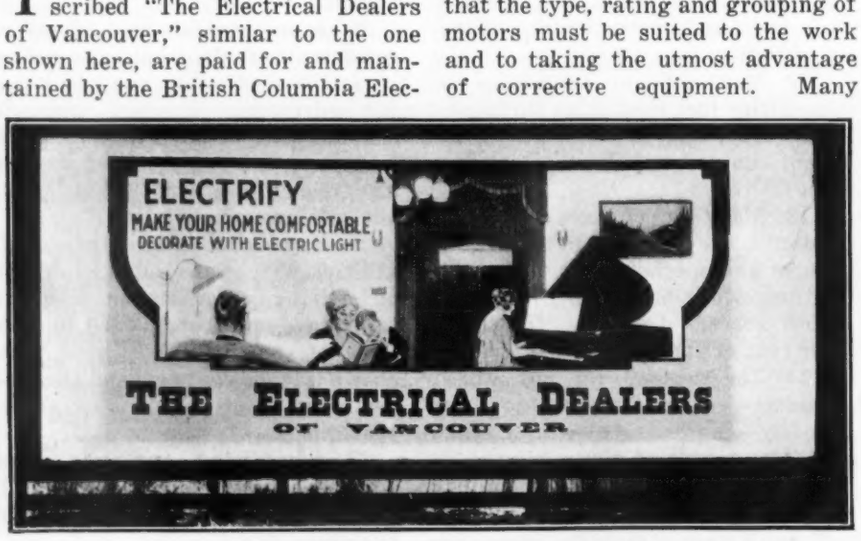
When it is considered that a mighty industry with a combined capitalization of more than $17,000,000,000, with a yearly gross business exceeding $3,000,000,000, deals in intimate daily contract relations with an aggregate of more than 33,000,000 customers, the importance of advertising to this industry need not be further emphasized.

There is expended in the United States each year for advertising a total of something in excess of $1,400,000,000, and of this amount the four major utilities—light and power companies, electric railways, gas companies and telephone companies—are using only about $7,500,000. It does look as if some of us have not acquired a very keen sense of business proportion.

Based on a 2 per cent minimum of annual gross business, the four utilities mentioned should be spending around $60,000,000 instead of $7,500,000. Instead of the 2 per cent minimum, the utilities are trailing along with an average of approximately one-fourth of 1 per cent. Five years ago, the amount was probably less than half what it is now.

## Central Station Boosts Dealers' Business

TEN illuminated billboards inscribed "The Electrical Dealers of Vancouver," similar to the one shown here, are paid for and maintained by the British Columbia Electric Railway Company of Vancouver, B. C. Although the company does a merchandising business itself, the billboards are maintained to help the dealers and to let the public know that there are other electrical interests in the city besides the central-station company. The company believes that in any event the sale of appliances results in the greater use of electrical energy, which will be reflected in increased revenue.




TYPE OF BILLBOARD MAINTAINED BY CENTRAL-STATION COMPANY

## Savings to Customer of Good Power Factor

### Increases Speed of Production—Reduces Energy Consumption—Increases Efficiency and Improves Operating Characteristics of Machines

ON MAY 14, before the Philadelphia Section of the A. I. E. E., C. J. Russell and J. F. Gaskill of the Philadelphia Electric Company presented a valuable paper entitled "Power Factor—Its Relation to Industrial Plants." Mr. Gaskill, who read the paper, pointed out that the attitude of the central-station companies on the much-discussed question of power factor was to stimulate the customer to purchase and install power-factor corrective equipment and that the companies have done this very largely by incorporating power-factor clauses in their rate schedules. The result has been that frequently attention has been focused only on the economics of rates and there has been a lack of fundamental attempts to convince the customer of the other benefits of a good power factor.

There are many conditions in industrial plants that may make low power factor a source of expense to the customer far in excess of the amount of the rate discount. Any power-factor correction must be based on an analysis of the plant and its operation, and a fundamental requirement is that the plant should be properly motored. This means that the type, rating and grouping of motors must be suited to the work and to taking the utmost advantage of corrective equipment. Many times, too, the copper sizes should be readjusted to the actual load conditions. After making this analysis the power-factor corrective equipment should make an annual saving of at least 20 per cent on the first cost to justify its installation. An outstanding example of this method was found in a factory having a 30-kva. demand and 60 per cent power factor before correction was applied. After rearrangement of motoring the demand was reduced to 20 kva. and the power factor raised to 77 per cent with only 8.5 kva. of corrective equipment. In another case a 33⅓ per cent power factor was raised to 82.5 per cent by using static condensers.

A great advantage to the customer frequently not pointed out is the fact that a good power factor lowers line losses, improves voltage regulation, and consequently machine operation, and raises the efficiency of the machines. These savings are often appreciable. For example, in a hosiery factory for thirteen weeks before correction was applied the energy consumption per unit of product was 0.895 kw.-hr., and for twelve weeks after correction it was only 0.553 kw.-hr. This gave a saving of about 30 per cent in consumption of energy in addition to power-factor improvements. In another case the load was 54.7 kw. at 59.1 per cent power factor, and 63.5 kva. correction was needed, but after rearranging the motors, only two of which were replaced, a power factor of 92.1 per cent was obtained with 30 kva. corrective equipment.

In order to obtain these results—and in many installations such results cannot be obtained—an analysis of the installation and the use of graphic-meter studies of load cycles of the individual motors is essential before attempting correction. Motors, regardless of make, often differ in characteristics as regards the amount of magnetizing current, and ordinary commercial tests made by

the manufacturers will not detect this condition. Therefore it is necessary to take duty-cycle curves on the machines *in situ* and to study the requirements of the task the motor performs.

Power-factor correction at the source is best because it decreases the energy bill of the consumer by reducing losses and demand, decreases the energy loss and voltage drop in the service circuits, and increases the speed of production by maintaining better and more uniform voltage regulation. With source correction the use of few large-size units saves on investment costs for corrective equipment, but where many small motors are used group correction is best applied. From a load-characteristic standpoint there is the non-fluctuating, unvarying load such as electrolytic loads, in which indicating meters only are necessary for analysis. For the intermittent load, such as woodworking machines and machine tools, a graphic-chart study is best, and for rapidly fluctuating loads, either intermittent or steady, flywheels often prove useful and can be applied intelligently by using graphic charts.

After proper metering has been installed the next question is the type of corrective equipment to use. All features of the installation must be studied. The ideal method is to install equipment carrying load current. Practically the load may vary, and corrective equipment is adjusted for the no-load condition, after which a fairly good power factor can be maintained over the complete load range. Economic considerations dictate the amount of corrective kva. to use. Synchronous motors should be considered, in general, for the replacement of induction motors on loads of 50 hp. and over. The synchronous condenser is a bulk corrective device and enters into consideration for loads of 900 kw. and over on 2,200-volt circuits. For these loads it competes with the static condenser. Group correction with static condensers offers good possibilities where there must be no cessation of production and where a large number of small motors are grouped.

Correction at the motor terminals is not well suited for loads of low diversity or where small machines are used, and in these cases group correction is dictated.

The static condenser has operated very satisfactorily on the lines of the Philadelphia Electric Company and has given no indication of bad features due to harmonics or resonance effects. In closing, the author again accented the point that the consumer gets a number of advantages from operation with a good power factor besides the rate discount.

D. E. Drake, in discussing the paper, said that in general a great change could be made in demand without great change in energy consumption. He cited an example on a 20-hp. motor where the use of a type with 10 per cent slip as compared with 2.5 per cent slip changed the demand 20 per cent with only 5 per cent change in energy consumption. M. E. Skinner said the importance of power-factor correction was very evident and that steps should be taken to secure it. He also discussed power-factor rate clauses and proposed using both a penalty and a bonus. The manufacturers might, he thought, do something in the way of getting better designs of machines from the power-factor standpoint. L. W. W. Morrow pointed out that the commercial application of power-factor correction involves the supervision of customers' equipment or the use of complicated rate and metering systems.

## Worcester Appliance Sales a Third Above Last Year

THE manager of the appliance department of the Worcester (Mass.) Electric Light Company, O. R. Underhill, reports that sales for the first quarter of 1923 averaged $2,194 per week against $1,610 for 1922 and that the estimated revenue from these sales in energy consumed is $4,930 per year. Merchandising conditions are also better than those of 1921 by about the foregoing margin. Among the items sold in the first quarter of this year are 330 flatirons, 106 vacuum cleaners, 106 portable lamps, 90 two-compartment fireless cookers, 78 washing machines, 39 heating pads, 39 toasters, 37 curling irons, 31 heaters, 23 fireless cookers of a different type from the above, 18 hot plates, 12 percolators and 10 waffle irons. During the past few months the company has authorized the use of more space for appliance demonstration on the main floor of its general offices and has paid increasing attention to effective window displays. A carefully prepared series of articles with an engineering "slant" on home electrification by George M. Hardy, general superintendent of the company, has been running in the company paper, the *Live Wire*, and these have aroused considerable interest among employees and outside readers.

## Ranges as Income Bringers

THE electric range and the electric water heater, like the automobile in transportation, are coming to fill an increasingly important place in the kitchens of the average home. The accompanying table is given to show what the electric range and water heater mean to the central station in yearly and monthly revenue. In compiling this table an electric water heater is rated the same as an electric range, and where both are used they are served through one meter.

The outstanding feature about the revenue derived from range consumers is the fact that, in spite of lowered rates, the income per month per range has increased. In the year 1921 the income per range increased almost 20 per cent in the face of approximately 30 per cent reduction in rates for this service. In 1922 there was a still further increase in income from each range with a 10 per cent reduction in the cost of energy to the consumer. The reason for this increase in revenue from ranges is not hard to explain. When an electric range is placed in the kitchen it soon proves itself to be a paying investment. It saves time, food and labor, protects the family health, and with the later automatic types of ranges has in some cases eliminated the necessity of a servant.

All of these factors are but the entering wedge for a completely

SOUTHERN CALIFORNIA EDISON COMPANY'S REVENUE FROM ELECTRIC RANGES AND WATER HEATERS
(1919 to 1922 inclusive)

| Year | Number of Ranges | Number of Water Heaters | Total | Total Yearly Revenue | Yearly Revenue per Range | Monthly Revenue per Range |
|---|---|---|---|---|---|---|
| 1919 | 1,689 | 663 | 2,352 | $89,811.74 | $38.19 | $3.18 |
| 1920 | 2,015 | 835 | 2,850 | 139,394.96 | 47.00 | 3.91 |
| 1921 | 2,549 | 652 | 3,201 | 178,729.70 | 55.80 | 4.65 |
| 1922 | 3,084 | 757 | 3,841 | 221,551.48 | 57.65 | 4.80 |

equipped electrical home—first one appliance and then another follows the range. Probably the first is the electric water heater, then the dish washer, air heater, mangle, toaster, percolator and so forth.

It is these additional electrical servants that are increasing the income from each range user. After installing a range a great many consumers have begun to heat their homes with electricity, and on the ranches electric incubators and brooders have been added.

Fifteen hundred to two thousand electric ranges and five hundred to eight hundred water heaters will be connected to the lines of the company during 1923.

## Vacuum Cleaner Show Brings Many Sales

ONE of the most successful of the New York Edison Company's series of appliance shows which have been held in its Irving Place showroom this spring was the vacuum cleaner exhibit from May 14 to 19. At this show twenty-eight different cleaners were displayed, and the manufacturers and dealers who participated in the exhibit expressed themselves as highly pleased with the results. Attendance at the show was exceptionally good, and 107 cleaners were sold from demonstrations on the floor.

The vacuum cleaner show was the sixth of the series which have been staged by the Edison company since the first of the year. The seventh and last of the shows will be the electric vehicle exhibit, June 4 to 9, N. E. L. A. convention week, and upon this special effort is being exerted to make it of particular interest to visiting central-station men.

## Utility Suspends Stock Sale to Help Another Industry

THE action of the San Joaquin Light & Power Corporation in suspending stock sales for a period of thirty days so as not to interfere in any way with the refinancing of the Sun Maid Raisin Growers' Association exemplifies the interest a power company should take in the community it serves. The company's campaign to sell $2,000,000 in prior preferred stock started on March 15 and was well under way when it became evident that the drive of the Raisin Growers' Association would require the undivided attention of every investor in the San Joaquin Valley. The raisin industry is of vital importance in the territory served by the power company, and accordingly a postponement in the sale of the utility's stock was declared so that the raisin men could have the right-of-way.

The following letter addressed to district managers and department heads of the San Joaquin Light & Power Corporation by General Manager A. Emory Wishon shows the company's policy of co-operation with other industries in its territory:

We have just started a campaign to sell our prior preferred stock to the public through the agency of our employees. Quotas have been allotted and the whole set-up has been based on the spirit of competition.

Just at this time the Sun Maid Raisin Growers are arranging for a drive to sell $2,500,000 in stock throughout the San Joaquin Valley. The stability of the raisin industry is the most vital and serious subject that has ever confronted this great valley. The Sun Maid stock must be sold. Our own drive will mean little to us if the raisin industry is not maintained on a strong, well-financed basis. Our drive must be regarded of secondary importance for the time being. We deem it highly advisable at this time to delay our own campaign until April 26 (Raisin Day), the date on which the Sun-Maid drive terminates.

On April 27 the sale of San Joaquin prior preferred stock will again be opened on the same basis as originally outlined. This delay will mean additional effort on the part of all of us during the remainder of the year; but I know you feel as I do that we must do everything possible during the next month to see that the Raisin Growers' effort at refinancing is successful.

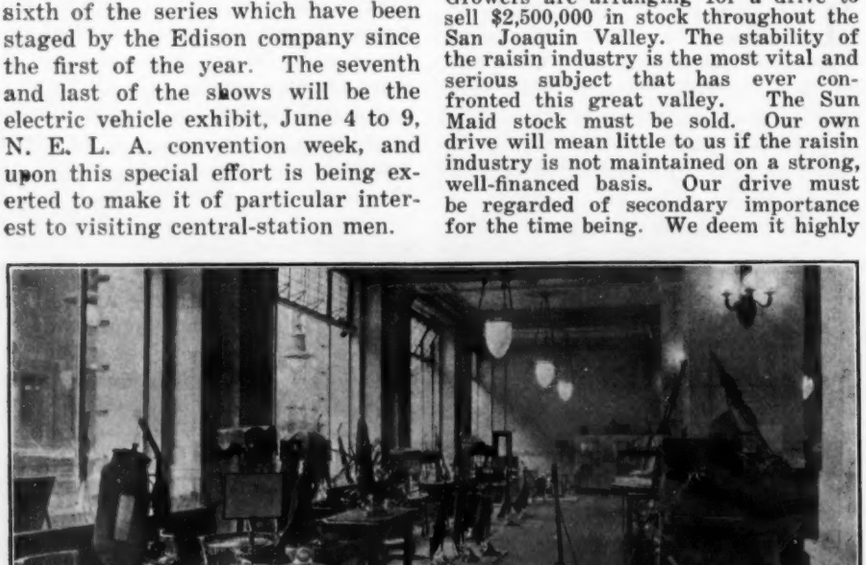
## What Other Companies Are Doing

**Providence, R. I.**—On March 1 the Narragansett Electric Lighting Company's lighting division faced a deficit of 30 per cent in campaign meters as compared with the total set up during the corresponding period of 1922. A "nothing down" house-wiring offer was therefore instituted, the first payment being due thirty days after signature of contract and the balance monthly with the same time limit as in other offers. Business immediately picked up, March showing 506 meters added and April 1,045 meters, or more than double the previous maximum monthly record. In two months, says F. A. Gallagher, Jr., manager of the division, the 30 per cent deficit was changed to a gain of 49 per cent over the same period last year.

**Indianapolis, Ind.**—On May 12 the Electrical Development Association of Indianapolis opened a nine-room electric home in this city for a one-week display to the public. For the promotion of the home a budget of $4,000 was appropriated by the electrical interests of Indianapolis, of which $3,700 was spent for publicity.

**Manchester, N. H.**—To obtain the needed increase in space for its general offices and appliance sales department, the Manchester Traction, Light & Power Company has announced the plans for a new office building to be erected in the shopping center of the city.

**Fresno, Cal.**—Work on the ten-story office building of the San Joaquin Light & Power Corporation is progressing rapidly, and it is expected it will be completed and ready for occupancy by Nov. 1 of this year. A large electric sign will be placed on the roof of the building, and special attention is being given to the lighting and electrical installation in the building. A radio-telephone set for broadcasting programs and load dispatching will be a feature of the company's new quarters.



ONE AISLE OF VACUUM-CLEANER EXHIBIT AT NEW YORK EDISON SHOWROOM

# Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

## Generation, Control, Switching and Protection

*Dynamic Braking Characteristics of Induction Motors.*—T. P. KIRKPATRICK.—Dynamic braking is obtained by disconnecting the motor from the power line and applying direct current to one or more phases of one member, usually the stator, while the windings of the other member are closed through a resistor. Then when the rotor turns the conductor cuts the magnetic field, inducing voltage and current with the resulting torque. The method of predetermining the performance of a motor under these conditions is described. The torque obtainable is equal to about 150 per cent of full-load torque. While dynamic braking is not adapted to all braking requirements, there are many applications where its advantages merit careful consideration.—*Electric Journal*, April, 1923.

*Problems in High-Speed Alternators and Their Solution*—J. ROSEN.—The author presents in a concise form some of the more interesting problems encountered and the methods adopted to solve them. Among the subjects covered are the history and failures of turbo-alternators, mechanical construction of rotors and caps supporting the coil ends, stator windings and insulation, stator slots, ventilation and cooling, exciter instability, eddy currents in rotor and several oscillographic tests.—*Journal of the Institution of (British) Electrical Engineers*, April, 1923.

## Hydro-Electric Development and Steam Equipment

*Preliminary Developments on a Hydro-Electric Project.*—H. K. FOX.—On the north and west forks of the Kings River in California the San Joaquin Light & Power Corporation has started work on the first unit in a chain of hydro-electric developments that will ultimately produce more than 300,000 hp. The main features of the development discussed are the four storage reservoirs, ten diversion dams, 34 miles of tunnels and conduits and seven proposed power plants.—*Engineering News-Record*, April 19, 1923.

*Steel-Mill Power Costs Reduced by Heating Feed Water.*—L. HELANDER.—A significant reduction in fuel consumption can be obtained by using multiple-stage condenser heaters and bleeding the main turbine. This involves replacing the common method of the feed-water heating in an open heater by a series of closed heaters. The author demonstrates the merits of the various methods of heating the feed water and of driving the auxiliaries by establishing heat balancers for an assumed steel plant having steam-driven turbo-blowers, steam turbine generators and completely electrified mill drive. He presents a table of comparative fuel consumption and power data for various methods of driving auxiliaries and heating the boiler-feed water of a steel plant.—*Iron Age*, April 12, 1923.

*High-Temperature and High-Pressure Steam Lines.*—B. N. BROIDO.—An abstract of this paper, presented at the annual meeting of the A. S. M. E., may be found in the ELECTRICAL WORLD for Dec. 9, 1922, page 1291.—*Mechanical Engineering*, May, 1923.

## Transmission, Substations and Distribution

*Calculation of Direct and Alternating Current Networks.*—F. T. CHAPMAN.—The author discusses the "break" or "cutting-point" method for calculating direct-current networks and introduces a complementary theorem to show the usefulness of these methods for alternating-current circuits.—*Electrical Review*, March 30, 1923.

*Fatigue of High-Voltage Cables.*—M. KLEIN.—Basing his observations upon a large series of carefully conducted tests on specially made paper-insulated high-voltage cables, the author describes a heretofore unobserved phenomenon of fatigue observed on the cable. One of two equal lengths of cable was subjected to the standard voltage test, the other was intermittently tested with a considerably higher tension. Short lengths of these two cables were then electrically punctured. The higher-stressed cable broke down at 10 per cent lower values than the normally stressed cable. Further overvoltage tests lessened the dielectric strength of the cable to 13 per cent below that of the normally tested cable. Five weeks later the same cables were tested again, without previous stressing, and it was found that they both now showed the same dielectric strength. The author assumes from this that the previous decrease of the puncture voltage must have been due to a temporary fatigue effect from which the cable recovered. That the heating of the cable due to the overvoltage stress could not have been responsible for the lessened dielectric strength was demonstrated by check tests in which the cable was purposely heated before being tested.—*Elektrotechnische Zeitschrift*, March 15, 1923.

*Inductive Interference Between High-Voltage and Low-Voltage Lines.*—R. RÜDENBERG.—Much has been written on this subject, but all calculations were based upon the partial capacities of the two lines under consideration. This paper shows a direct and much more convenient method by taking into account the electric fields formed around the wires. Formulas are developed for single, two-phase and three-phase lines, with concrete examples for each case. An important part of the article is devoted to conditions on three-phase lines with a ground on one of the conductors.—*Bulletin de l'Association Suisse des Electriciens*, March, 1923.

## Units, Measurements and Instruments

*Directions for the Study of Pressboard for Electrical Insulating Purposes.*—The report of the British Electrical and Allied Industries Research Association on pressboard for electrical insulating purposes. It contains definitions, terminology and classification of pressboard, tests and a method of ascertaining the electrical strength of pressboard when subjected to long application of alternating-current stress. The specific tests described include the following: tensile strength and extension, compression strength, shearing or tearing strength, cohesion between layers, flexibility, electric strength, shrinkage and swelling, freedom from chemical reaction, conducting particles and pinholes, effect of oils, water absorption and determination of thickness and density.—*Journal of the Institution of (British) Electrical Engineers*, April 1923.

*Control of Boilers by Temperature and Draft Measurements.*—J. B. C. KERSHAW.—The author describes various types of draft gages and temperature indicators. He discusses the proper location both for induced-draft and forced-draft systems and points out the best location for draft gages and temperature indicators.—*Engineer*, April 27, 1923.

## Illumination

*Electrifying the Garment Industries.*—The methods used by a successful electrical contractor in wiring lofts for the garment industries are described. The description tells the requirements of each department and how these requirements are met both in the correct planning of the machines and the installation and selection of the proper electrical and lighting equipment. A comprehensive table of dimensions, outlets and lighting units used in a typical garment loft is given.—*Electrical Record*, April, 1923.

## Heat Applications and Material Handling

*Transformer to Heat Wheel Tires.*—T. PAUSERT.—Locomotive and car-wheel tires are fastened to the wheel body by heat shrinking. The heating of the tire is done either with a charcoal fire or with a number of gas torches. It requires 3 cu.m. to 6 cu.m. of gas to heat one tire of a diameter of 104 m. to 1.50 m. Considerable difficulty is encountered in heating the tire uniformly by these methods and in controlling the heating properly, and a new electric induction type of heater

has been developed for this purpose, based upon the same principle as an induction furnace. A two-legged transformer core with the primary winding placed around the lower yoke has an easily removable upper yoke, the magnetic joint being of the butt type. With the yoke removed, the tire is placed over one of the upright transformer legs, the yoke is closed, and the primary winding is energized. The tire represents the short-circuited secondary winding and will soon come to the necessary red heat. Two models are being manufactured for tires up to 0.80 m. and up to 1.90 m. diameter respectively. To heat an 0.80 m. diameter tire, 25 kva. at 65 per cent power factor is required for twenty-five minutes. Primary winding taps permit heat regulation within wide limits.—*Revue Générale de l'Electricité*, March 24, 1923.

## Motors and Control

*Starting of Three-Phase Induction Motor with Cage Rotor.*—T. HASEGAWA. — In the three-phase squirrel-cage induction motor the problem of increasing the starting torque and of suppressing the heavy starting current have been the most troublesome. The author classifies and tabulates the various methods that have been developed along this line.—*Journal Institute of Electrical Engineers of Japan*, March, 1923.

*Brush-Shifting Polyphase Motors.*—R. A. JONES and F. A. ANNETT.—For loads requiring speed adjustments the polyphase brush-shifting alternating-current motor is finding wide application. In this article the fundamentals governing the operation of this type of motor are explained by comparing its action with that of a direct-current series motor.—*Power*, April 17, 1923.

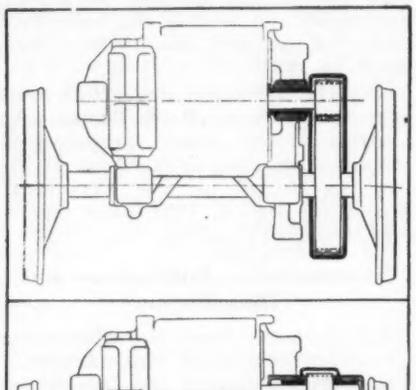
## Electrophysics, Electrochemistry and Batteries

*Reactions of the Lead Storage Battery.*—M. KNOBEL.—After a short theoretical discussion of the lead storage batteries, the results of the author's investigations are given. These support the evidence in favor of the Gladstone and Tribe theory of reactions in the lead storage batteries. The claim of Fery that only one mol of sulphuric acid is used per two faradays on discharge is not supported, which tends to disprove Fery's theory.—*Paper Presented Before American Electrochemical Society*, New York, May 3-5, 1923.

*Oscillations Produced by Means of a Tungar Rectifier.*—Y. WATANABE.—The author treats of the relation between oscillation and the heating condition of the filament of the tungar rectifier, which forms the cathode of the arc. When the filament current is comparatively small oscillating currents of relatively high audio-frequency are produced, traversing the condenser connected across the terminals of the tungar bulb. This oscillation may be considered to be due to an ionic oscillation of negative ions in the arc. When the filament current is increased an intermittent current is produced in the condenser circuit, which is of low frequency. This phenomenon was oscillographically observed by Hull's arrangement for rectification with the kenotron.—*Journal Institute of Electrical Engineers of Japan*, April, 1923.

## Traction

*Double Bearing for Railway Motors.*—M. KAMMERER.—The author suggests increasing the life of the gears by abandoning the traditional flying pinion and that a bearing on either side of the



PINION OF DRIVING MOTOR PLACED BETWEEN DOUBLE BEARING

pinion be used instead. As these two bearings can be each only half as long as the previously used single bearing, it should not be difficult to find room for this construction, as will be seen from the accompanying figure. With such a bearing construction, a pressure on the teeth not exceeding 600 kg., and lubrication with oil rather than with heavy grease, the life of these gears will be very materially increased. —*Elektrische Betrieb*, March 24, 1923.

*Alternating-Current Locomotives in Northern Sweden.*—W. REICHEL.—The important cross-country railway in northern Sweden connecting Lulea and Narvik, both north of the Arctic Circle, has now been completely electrified and is, with a length of 475 km., one of the longest European electric railroads. The road is used primarily for the transportation of heavy iron-ore trains. Thirty to forty cars, each loaded with 35 tons of ore, is the average train capacity to be hauled, and a yearly total of five million tons has to be transported. The paper does not go into any detail concerning the locomotive type, but describes in a general way the experiences of operation on this unusual line with the older (1914) and the latest type of 1C+C1 engines. The machines cover on the average 12,000 km. per month, or, with 250 operating days, 150,000 km. per year. *Siemens Zeitschrift*, March, 1923.

## Telegraphy, Telephony, Radio and Signals

*Specializing Transportation Equipment for Telephone Construction and Maintenance Work.*—J. N. KIRK.—The author describes in a general way the application of motor vehicles and their associated apparatus in connection with outside plant construction and maintenance work, outlining through the successive stages of development what has been accomplished in this respect up to the present time. To give a comprehensive picture, the more primitive types of equipment, together with the manual methods of doing work, are shown in comparison with representative instances of higher development during the past few years.—*Electrical Communications (published by the International Western Electric Company)*, February, 1923.

*Practical Application of Carrier Telephone and Telegraph in the Bell System.*—A. F. ROSE.—The author summarizes the application of carrier current up to the present time and gives a few typical examples where it has been found economical to provide circuits by means of carrier current rather than by other types. At present in the carrier telephone system there are twenty-nine channels, representing a distance of 14,636 miles. In the carrier telegraph system there are 151 channels, representing 83,713 miles. Line diagrams of the more important systems are given.—*Bell System Technical Journal*, April, 1923.

## Miscellaneous

*Electric Piloting of Ships.*—The entrances of several large harbors are already equipped for electric piloting, which is made possible by a submarine cable laid along the bottom of the entrance channel. The cable is charged from its shore end with alternating current of 500 cycles, while its other end is grounded at sea. On each side of the piloted ship a coil is placed, and the current induced in these two coils is compared by listening on two telephone receivers. As long as the ship keeps directly above the pilot cable the sound in the two telephones will be of equal strength. The Siemens piloting system, however, does away with the necessity of steering by sound. The cable is energized with commercial alternating current of 50 cycles, and the induced current in the coils, after being amplified through a set of electron tubes, is used to actuate a double moving-coil instrument, with one coil and pointer for starboard and the other coil and pointer for port. To enable a ship equipped with the Siemens system to respond also to a 500-cycle cable, two sets of amplifiers are provided for the indicating instruments, one set for the low-frequency and one for the high-frequency current. The induction coils on board ship measure each 1,000 mm. by 650 mm. and may be swung flat against the side of the boat when not in use.—*Siemens Zeitschrift*, March, 1922.

# News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

## Drop Protest on Lock 17

**Alabama Power Company Likely to Get Permission to Build Plant—Power Loop Still Opposed**

WITH the withdrawal of a protest by the Birmingham Water, Light & Power Company against the granting by the Alabama Public Service Commission of a petition from the Alabama Power Company for permission to develop hydro-electric power at the government dam at Lock 17 near Tuscaloosa, it is thought certain that the company's petition will be granted. It was brought out at a hearing last Saturday that the projected plant would cost approximately $500,000 and would insure an annual saving of approximately $120,000 as compared with a steam plant. A 10,000-hp. unit can be ready for operation within twelve months from the time permission is granted. Successful operation of a plant at the site is dependent upon ability to tie in with transmission lines conveying the power to places where it can be used.

OPPOSITION TO POWER LOOP

Strong objection was raised to the petition of the Alabama Power Company to build a transmission line from Sheffield to Huntsville, which, as shown in the ELECTRICAL WORLD for May 5, page 1052, would complete a "power loop" in Alabama. The chief objection was that such a line would further hurt the chances of Henry Ford at Muscle Shoals.

It was revealed, however, that the Tennessee Valley is not a unit in opposing the plans of the Alabama company. Representatives of various cotton mills and other manufacturing enterprises at Huntsville, Sheffield, Athens and Albany-Decatur appeared before the commission and declared that their plants needed the power that would be carried over the new line. They called on the commission to grant the petition of the company at once.

## Public Service Company Is Mapping by Airplane

Following the growing practice of central-station companies of using airplanes in surveying the route for new transmission lines, the Public Service Electric Company of New Jersey is obtaining maps in this way instead of employing state and National Geographic Survey maps, as was its former practice. The state and national maps were made to a scale of 2,000 ft. to 5,000 ft. per inch, while the serial maps obtained from the airplane are on a scale of only 800 ft. to the inch and show in detail the surrounding territory. Relative heights of buildings, chimneys and trees are determined by the shadows on the ground. The character of the surface of the ground and of farm lands stands out in bold relief. Measurements made in the field between prominent land marks check accurately with the scaled-map distance.

In order to get accurate picture maps, the airplane flies at a uniform altitude of 10,000 ft. and many pictures are taken. When printed they are matched accurately, the sections which overlap being eliminated. The company has a continuous aërial map showing the meadows from Newark Bay and the Passaic River to Passaic and Paterson, also one of Hudson County, including the Kill von Kull, Bergen Point, Bayonne and part of Jersey City. A map is now being made of the southern division.

## Harris J. Ryan New President of A. I. E. E.

**Formal Ratification of Directors' Nominations Made at Annual Business Meeting—Net Growth of 1,035 in Membership, with 847 Section and Branch Meetings**

PROF. HARRIS J. RYAN
President-Elect A. I. E. E.

PROF. HARRIS J. RYAN of Stanford University, California, was elected president of the American Institute of Electrical Engineers at its annual business meeting, held in New York on May 18, and the other officers selected in March as "directors' nominees" were formally confirmed. The five new vice-presidents, who take office along with the president on Aug. 1, will be: From district No. 2 (Middle Eastern), William F. James, Westinghouse Electric & Manufacturing Company, Philadelphia; district No. 4 (Southern), Henry E. Bussey, General Electric Company, Atlanta; district No. 6 (North Central), Herbert S. Sands, Westinghouse company, Denver; district No. 8 (Pacific), J. E. Macdonald, Los Angeles; district No. 10 (Canada), S. E. M. Henderson, Canadian General Electric Company, Toronto. The three new managers are: William M. McConahey, Westinghouse company, East Pittsburgh; William K. Vanderpoel, Public Service Corporation, Newark, N. J., and H. P. Charlesworth, American Telephone & Telegraph Company, New York. George A. Hamilton, Elizabeth, N. J., was re-elected treasurer.

In the annual report of the board of directors, which was presented at this meeting, very satisfactory results of the membership committee's efforts were shown. The institute has now six honorary members, 578 fellows, 2,264 members and 12,450 associate members, a grand total of 15,298, which is a net gain of 1,035 as compared with the previous year. The report on activities of local sections and student branches showed that there are now forty-six sections and sixty-eight branches, a gain in each case of one over last year. Three hundred and forty-four section meetings, with a total attendance of 46,672, and 503 branch meetings, with a total attendance of 26,893, were held, making an aggregate attendance of 73,565 at 847 meetings.

Sixty-three deaths, five of fellows, ten of members and forty-eight of associates, occurred in the year.

## Another Step in Massachusetts Superpower Development

By the incorporation of the Montaup Electric Company of Fall River, Mass., with a capital stock of $7,500,000 divided into 15,000 shares of preferred and 60,000 shares of common stock, another forward step has been taken in the development of the superpower idea in the Bay State. As recently announced in the ELECTRICAL WORLD, this company is formed to generate,

transmit and sell electricity from a new tidewater station to be built on Mount Hope Bay at Fall River, the systems of the Fall River Electric Light Company, the Blackstone Valley Gas & Electric Company and the Edison Electric Illuminating Company of Brockton to be the beneficiaries of the plan. Transmission lines and other equipment for the interconnection of these companies form a part of the program. The incorporators are S. B. Chase, president, and Henry B. Sawyer, treasurer, who, with R. F. Whitney, A. Stuart Pratt and V. D. Vickery, are directors.

## Eber Bill Amended

**Effort to Prevent All Water-Power Development in Wisconsin for Six Years Fails**

THE menace to the development of hydro-electric plants on water-power sites in Wisconsin by private companies which for a time was seriously threatened by the possible enactment of the Eber water-power survey bill was thought to have passed when the joint finance committee of the State Legislature voted on Thursday, May 17, to postpone a vote on the bill indefinitely. The proposed measure would have held up for six years all water-power development in Wisconsin pending an extensive survey by the Railroad Commission in the interest of state exploitation. A few days later, however, the Assembly ordered the bill engrossed, changing the six-year period of cessation to two years.

Among those who appeared in opposition to the bill at a hearing before the committee was G. C. Neff, vice-president of the Wisconsin River Power Company, who charged the sponsors of the Eber bill with trying to make the people believe that by developing water-power sites the entire state can be electrified. "This is untrue," he said. "Hydro-electric plants will serve only as supplementary sources of power. The steam plants will continue to be the dependable generating stations. If all the available water-power resources capable of economic development in Wisconsin were utilized and made available by 1930, it would amount to about only 25 per cent of the total electrical energy consumed." Mr. Neff also accused the sponsors of the bill of holding out the false hope that electricity can be generated so cheaply that it will take the place of coal in heating homes.

Russ A. Walter of Detroit, a personal representative of Henry Ford, also appeared in opposition to the bill. "Mr. Ford has already developed water-power sites in Michigan and has erected branch plants on his properties," said Mr. Walter. "The same policy will be followed in Wisconsin."

Mr. Walters upon being asked directly whether Mr. Ford planned to enter the water-power development field in Wisconsin in the next six years, replied that that was his plan.

## Water-Power Conference

**Eight Southern States, Including West Virginia, To Be Represented at Asheville Meeting**

AT THE second meeting of the Southern Appalachian Water Power Conference, to be held at Asheville, N. C., June 25-27, there will be in attendance representatives of the eight states of North and South Carolina, Virginia, West Virginia, Georgia, Tennessee, Alabama and Mississippi, including outstanding figures in public utility companies, public service commissions and state geological and conservation work, engineers, bankers and manufacturers.

One of the most important problems to come up will be interchange of power between companies in the several states, this involving not only economical and engineering but legal and industrial considerations. The possibilities of interconnection were vividly illustrated last summer and in the drought of 1921, when the Alabama Power Company diverted the power of the Gorgas steam plant near Muscle Shoals, sending it to the Georgia Railway & Power Company, which in turn transmitted an equal amount of energy to the Southern Power Company, the latter relaying the power received to the Carolina Light & Power Company for the use of its customers in Raleigh and neighboring sections. This operation involved a transfer of power over interconnected lines of approximately a thousand miles, operating in four states.

Another important question to be discussed will be the establishment of central steam plants to supplement hydro-electric stations. Preferably these plants would be built near coal mines and on streams affording a suitable supply of water for condensation. The only known site in North Carolina which fulfills the requirements is in the first stage of development by the Carolina Light & Power Company, which is building near Moncure a 15,000-kw. unit as a part of plans which contemplate an ultimate development of 60,000 kw. The plant is on the Cape Fear River and near the Deep River coal fields.

The conference will also consider an expansion of activities to include departments concerned with public relations, power companies, regulatory bodies and the general public, as well as departments for compiling and disseminating information as to natural resources, including water powers, minerals, forests, etc.

## Time for Obtaining New York Licenses Extended

Some confusion exists regarding the proper interpretation of the law passed in New York to govern the licensing of engineers, and as a result an emergency bill pushed through the Legislature and signed by the Governor has extended the period in which licenses may be obtained from May 5 to Aug. 1, 1923. The misunderstanding which originally existed has been further complicated by an interpretation of the law handed down at the last minute by Prof. A. S. Downing, in charge of its enforcement, to the effect that any person above the grade of plumber who may be compelled to exercise initiative, skill or judgment in engineering construction work must have a license. Interpreted more specifically in terms of electrical construction, this would mean that any construction man who builds a line and does not follow in detail a blueprint reviewed by a licensed engineer would be compelled to have a license.

The Empire State Gas and Electric Association points out that this interpretation makes no distinction between grades of engineering and allows anyone having a license to practice in any branch of engineering regardless of whether he is fitted to do so or not. Feeling that such a ruling is not justified, the Electric Section of the association, assembled at Utica May 17, voted in favor of appointing a committee to discuss with Professor Downing the proper interpretation of the law.

## Los Angeles City Authorities for Boulder Canyon Plan

A DEMAND on the municipal electric system of Los Angeles which is increasing at the rate of 20 per cent compounded annually is made the text of a folder prepared by the city's Department of Public Service for the information of its citizens. This folder says:

"The total quantity of power that can be developed by the city along the aqueduct and on Owens River streams amounts to about 220,000 hp. Contrast this available supply of electrical energy with the city's increasing needs. For the past five years the use of electrical energy in Los Angeles has increased at the rate of 22 per cent compounded annually. Assuming only a 15 per cent annual increase for the next seven years, by 1930 the entire city for all purposes will require 540,000 hp."

Boulder Canyon, on the Colorado River, is the logical source for the development of a large new hydro-electric supply for Los Angeles, in the opinion of the department. "Los Angeles should stand ready to secure its fair share of Boulder Canyon power," the folder says. "Boulder Canyon power, delivered to this city by its municipal electric system, will insure the continuation of low electric rates; it will supply the energy so urgently needed if Los Angeles is to continue to grow industrially and commercially. Los Angeles seeks only its fair share of this power after the requirements of all other communities within economic reach have been satisfied. In addition to supplying the urgent power requirements of Los Angeles and the Southwest generally, electrical energy developed at Boulder Canyon will provide the money to repay the federal government the entire cost of the high dam."

## Final N. E. L. A. Program

**Addresses by President Lowell of Harvard, Melville E. Stone and H. B. Swope Are Added**

OFFICIAL announcement by M. H. Aylesworth, executive manager of the National Electric Light Association, is to the effect that the program for the forty-sixth convention of that body in New York City beginning a week from Monday is now complete and the "best ever offered to any industry." Concerning some special features of the program Mr. Aylesworth says:

"The Public Relations Section will have a program for executives beginning Monday afternoon, June 4, at 2:30, dealing with all angles of this most important subject. On Monday afternoon Thomas A. Edison will deliver a message to the Public Relations Section which should mean a great deal to the industry. On Tuesday afternoon leading newspaper men will deliver timely addresses telling us more about publicity, and the subject will be thoroughly discussed in a symposium by chairmen and directors of state committees on public utility information. Herbert Bayard Swope, executive editor of the New York *World*, and Bruce Barton, editor and writer, will open the discussion. On Wednesday afternoon public utility commissioners from various states and electric light and power company executives will discuss public relations. Thursday afternoon has been set aside for the customer-ownership committee, and B. C. Forbes, publisher and financial writer for the Hearst organization and other syndicates, will open the discussion, while prominent leaders of the industry, including Samuel Insull and E. K. Hall, vice-president American Telephone & Telegraph Company, will address the meeting.

"The morning sessions, beginning Tuesday morning and closing Friday noon, will be addressed by prominent men in the industry and reports of great importance will be presented. Among those from without the industry who will talk at the four morning sessions are O. E. Bradfute, president of the American Farm Bureau Federation; Melville E. Stone, counselor Associated Press; Lewis E. Pierson, chairman of the board, Irving Bank-Columbia Trust Company; Dwight N. Lewis, president National Association of Railway and Utilities Commissioners; President A. L. Lowell of Harvard University, and O. C. Merrill, executive secretary Federal Power Commission. On the night of June 7, at Carnegie Hall, Julius H. Barnes, president of the Chamber of Commerce of the United States, will deliver an address on public ownership which will be carried by radio to the entire nation."

The addresses by President Lowell, M. E. Stone and H. B. Swope, as well as those by Samuel Insull and E. K. Hall, are features not included in the tentative program printed last week.

## Sixty-one Big Installations Under Way

**Larger Power Stations and Extensions Built in 1923 Will Have Rating of 3,546,000 Kva.—Nearly One-third of New Plants Are Hydro-Electric—To Cost $469,100,000**

BELOW is a tabulation of the chief power stations and extensions to existing power stations that are now under way and therefore belong in the electric building program of 1923. Nearly all of these have been noted in the ELECTRICAL WORLD at the time of their official announcement. As the table shows, twenty-one of them, with an aggregate rating of 1,145,000 kva., are hydro-electric, and forty, with an aggregate rating of 2,401,500 kva., are steam. There are eight entries of 100,000 kva. or more, the largest being the 210,000-kva. hydro-electric installation of the Niagara Falls Power Company and the next largest the 200,000-kva. steam plant of the Public Service Electric Corporation of New Jersey.

Geographically, the distribution (in kva.) is as follows: Middle West, 1,355,500; Middle Atlantic States, 1,075,000; Southern States, 474,000; Mountain and Pacific States, 401,000; New England, 206,000.

## Electric Power Stations and Extensions Now Under Way

**(From the News Columns of the "Electrical World")**

HYDRO-ELECTRIC

| Company | Plant | Rating, Kva. | Company | Plant | Rating Kva. |
|---|---|---|---|---|---|
| San Francisco Municipal | Hetch Hetchy | 80,000 | Empire District Electric Co. | Table Rock | 60,000 |
| Metropolitan Power Co. | Susquehanna | 30,000 | Niagara Falls Power Co. | Niagara | 210,000 |
| Central Maine Power Co. | Skowhegan | 5,000 | Caddo River Power Co. | Ouachita | 90,000 |
| Western States Gas & Electric Co. | El Dorado | 30,000 | Pennsylvania Water & Power Co. | Holtwood | 30,000 |
| Portland Railway, Light & Power Co. | Oak Grove | 30,000 | Pacific Gas & Electric Co. | Pit No. 2 | 70,000 |
| Pacific Power & Light Co. | Deschutes | 7,500 | Great Western Power Co. | Caribou | 22,000 |
| New England Power Co. | Davis Bridge | 30,000 | Skagit River Power Co. | Skagit | 34,500 |
| Northern States Power Co. | St. Croix | 90,000 | Wisconsin-Minnesota Power Co. | Jim Falls | 12,000 |
| Alabama Power Co. | Mitchell Dam | 90,000 | Los Angeles Municipal | San Francisquito | 25,000 |
| Denver Gas & Electric Light Co. | Boulder | 90,000 | Miscellaneous | | 35,000 |
| Georgia Railway & Power Co. | Mathis | 62,000 | | | |
| Pacific Power & Light Co. | Hood River | 12,000 | Total | | 1,145,000 |

STEAM

| Company | Plant | Kva. | Company | Plant | Kva. |
|---|---|---|---|---|---|
| Louisville Gas & Electric Co. | Waterside | 20,000 | Indiana Electric Corp. | Wabash | 100,000 |
| East Penn Electric Co. | Pine Grove | 50,000 | Union Electric Light & Power Co. | Cahokia | 60,000 |
| Houston Lighting & Power Co. | Deepwater | 40,000 | Boston Edison Co. | Weymouth | 66,000 |
| Northern States Power Co. | High Bridge | 75,000 | Brooklyn Edison Co. | Hudson Ave. | 125,000 |
| Tri-City Railway & Light Co. | Moline | 26,000 | Duquesne Light Co. | Colfax | 60,000 |
| Commonwealth Edison Co. | Crawford Ave. | 70,000 | West Tennessee Co. | Springdale | 70,000 |
| Commonwealth Edison Co. | Calumet | 60,000 | Detroit Municipal | City | 100,000 |
| Sand Springs Power, Light & Water Co. | Sand Springs | 12,000 | Cleveland Electric Illuminating Co. | Lake Shore | 60,000 |
| Public Service Co. of Northern Illinois | Joliet | 30,000 | Southern Power Co. | Mount Holly, etc | 50,000 |
| Public Service Co. of Northern Illinois | Waukegan | 40,000 | Middle West Utilities Co. | Grand Tower | 50,000 |
| Connecticut Light & Power Co. | Devon | 75,000 | Ohio Power Co. | Philo | 70,000 |
| Tennessee Electric Power Co. | Nashville | 12,500 | Potomac Electric Co. | Washington | 25,000 |
| United Electric Light & Power Co. | Hell Gate | 70,000 | Counties Gas & Electric Co. | Barbadoes Island | 25,000 |
| Oklahoma General Power Co. | Muskogee | 27,500 | Philadelphia Electric Co. | Delaware | 60,000 |
| Oklahoma Gas & Electric Co. | Harrah | 20,000 | Toledo Edison Co. | Toledo | 37,500 |
| Pennsylvania Central Light & Power Co. | Saxton | 80,000 | Luzerne County Gas & Electric Co. | Kingston | 25,000 |
| New England Power Co., etc. | Montaup | 30,000 | Lorain County Gas & Electric Co. | Elyria | 25,000 |
| Illinois Electric Power Co. | Peoria | 120,000 | Public Service Electric Co. | New Jersey | 25,000 |
| Detroit Edison Co. | Trenton Channel | 150,000 | Consumers' Power Co. | Zilwaukee | 100,000 |
| Public Service Electric Corp., (N. J.) | Kearney | 200,000 | | | |
| Public Service Electric Corp., (N. J.) | Essex | 60,000 | Total | | 2,401,500 |

TOTAL COST

| | | |
|---|---|---|
| Hydro-electric (21 installations) | 1,145,000 kva., estimated at $200 | $229,000,000 |
| Steam (40 installations) | 2,401,500 kva., estimated at $100 | 240,100,000 |
| | 3,546,500 | $469,100,000 |

## Syracuse's Lighting Plan

### Well-Thought-Out System for Three-Million-Dollar Installation—Costs of Street Opening

A PLAN adopted by the city of Syracuse, N. Y., for lighting its streets and described by K. V. Farmer at the Utica meeting of the Electric Section of the Empire State Gas & Electric Association last week provides for a thoroughly modern and well-considered system to cost $3,000,000. Briefly, the plan calls for four types of lighting, for business, main and secondary thoroughfares and residential streets. It includes the abandonment of 700 five-lamp ornamental poles and 2,000 4-amp. luminous-arc lamps on overhead lines. All the new lighting will be supplied from underground cables.

For business thoroughfares the plan provides cast-iron posts with two 6.6-amp. inverted luminous-arc lamps, spaced approximately 100 ft. apart, with the light source 18½ ft. above the street. On side streets one light is alternated on posts with the lamp source 14½ ft. above the street. For main thoroughfares cast-iron posts will also be used, with 400-cp., 7½-amp. incandescent lamps and large lanterns, the posts to be spaced 125 ft. to 200 ft. apart. For secondary thoroughfares the same type of post, with 400-cp. lamps spaced 200 ft. to 250 ft. apart and the light source 12½ ft. from the ground, is adopted, and for residential streets similar posts, spaced 150 ft. to 250 ft. apart, with small lanterns having a light source 12½ ft. above streets, are to be erected.

Mr. Farmer told of successful results achieved by gas companies through the use of compressed air in opening streets and making excavations. The Syracuse Lighting Company, he said, was considering also the use of a special plow built by the Philadelphia Electric Company for the installation of parkway cable in residential streets.

Following the presentation of Mr. Farmer's report, W. C. Blackwood, electrical engineer of the New York & Queens Electric Light & Power Company, declared that he is using 30 per cent Para rubber-covered single-conductor cable without a lead sheath in fiber conduit for series street-lighting circuits run underground. To increase the use of existing distribution lines and relieve the stations of equipment, type RO transformers will be connected to such lines for feeding street-lighting circuits.

Considerable time is being saved by the Brooklyn Edison Company in tearing up pavement preparatory to the installation of underground cable, R. A. Paine, Jr., outside plant engineer of that company, asserted, by using Ingersoll-Rand gas-engine-driven air compressors and hammers. Five of these are mounted on trailers for distant jobs, and five are on trucks for close-in routing. Space is being saved in substations by supplanting street-lighting tub transformers by pole-type regulating transformers of 10 kw. and 20 kw. controlled by time switches. These are connected to commercial 2,400-volt circuits and have been in successful use for seven years. About 150 time clocks are installed on the system, which require two men to keep them wound.

By installing moving-coil, pole-type, constant-current transformers for street lighting the Utica Gas & Electric Company expects to eliminate station fires and excessive maintenance of switchboards, E. P. Peck, general superintendent of the electrical department, declared. At the same time it will be able to control and meter the street-light circuit from a central point.

## Empire State Engineers Meet at Utica

### Street Lighting, Plant Economies, Hydraulic Design, State Survey of Interconnection Possibilities, Overhead Distribution, Underground Construction and Other Topics Discussed

TIMELY engineering and operating problems were informally discussed by the Electric Section of the Empire State Gas and Electric Association at its meeting in Utica, N. Y., May 17 and 18, seven committees submitting reports. The manner of conducting the meeting was very effective and resulted in unusually valuable discussions. That on street lighting will be found at left.

Announcement of a survey of power and communication parallels in New York State now being made by the Empire State Gas and Electric Association in co-operation with the National Electric Light Association was made by W. F. Davidson of the Brooklyn Edison Company. Extensive studies are being made of the length of these parallels, the separation of the lines, voltage, frequency, type of power system and telephone circuit, satisfactoriness of telephone service, etc. This information is being collected to show the fallacy of placing drastic limitations on the proximity of power lines to telephone lines, it having been advocated in some sections that 2,300-volt parallels be limited to 3,000 ft. with 60-ft. separation and 110,000-volt parallels separated at least 1,500 ft.

It was pointed out by W. M. Carpenter, assistant secretary of the association, that rural service will be delayed if too drastic restrictions are placed on power and communication parallels.

E. P. Peck advised operating companies to consult the National Electric Light Association regarding their inductive interference problems rather than to try to handle them themselves.

Two peculiar cases of inductive interference were related by O. C. Davidson, Rochester Gas & Electric Company, and C. P. Scheller, St. Lawrence Transmission Company, which indicated the necessity of considering the circuit as a whole and not merely the parallels.

#### Economies in the Boiler Room

Experiences in improving the operating economy of a specific plant were related by A. C. Jordan, general superintendent of the Elmira Water, Light & Railway Company. Particular attention was directed to reducing banking losses, blow-down, auxiliary steam and economizer troubles. By changing the method of banking the amount of coal required was reduced two-thirds; it now amounts to about one-tenth of a pound per boiler-horsepower per hour. Foremerly a station which had about 5,000 hp. in 750-hp. boilers had to blow down 15,000 lb. of water per day. Now they are not blown down at all. The boilers are filled once every three weeks with fresh water and 100 lb. of soda ash and tested regularly with a conductivity meter for salt content. When the concentration exceeds 35 grains per gallon the boiler must be blown down, but this has not been found to be necessary during the period of three weeks in which the boilers are operated continuously at 200 per cent. At the end of this time the boilers have to be shut down for maintenance anyway.

A study of the auxiliary steam requirements of circulating and boiler-feed pumps disclosed the fact that they were taking 50 per cent of the auxiliary steam. The equivalent steam consumption was greatly reduced by electrifying the auxiliaries and bleeding steam from the turbines for feed-water heating. In addition, the pump speeds were reduced to minimize the friction head and spring water at 56 deg. F. taken from driven wells mixed with river water at 32 to 80 deg. F. for circulating water. Means for adjusting the speed of pumps were highly favored.

Experiments with the best temperature of feed water for economizers disclosed the fact that it should be somewhere between 120 deg. and 157 deg. to avoid the extremes of sweating or steaming.

#### Tendencies in Hydraulic Design

The design and installation of hydraulic equipment are tending toward simplicity, according to C. P. Scheller, St. Lawrence Transmission Company, who spoke on developments in this equipment. Impeller-type waterwheels are coming into use for heads up to 30 ft. While the efficiency of the unit is not so high as that of some other types of wheels, still its speed is so much higher that the over-all efficiency of a plant involving these units will be about the same. Straight-draft tubes are showing higher efficiency, and utilization of the siphon principle is enabling the setting of waterwheels above the pond level where this is not too much above tailwater. Integral-type governors attached to the turbine shaft are coming into use, and in some cases separately mounted flyball governors driven by synchronous motors are being used to

eliminate connections with the turbine. Oil-lubricated, babbitted bearings are gradually replacing lignum-vitæ bearings. Separate pumps for each bearing are also coming into use.

Committee work in New York State concerning the feasibility of greater interconnection within the state, as well as with systems in adjoining states, was outlined by E. P. Peck, general superintendent electrical department, Utica Gas & Electric Company. (See page 741, ELECTRICAL WORLD, Mar. 31.)

### OVERHEAD DISTRIBUTION PRACTICES

The report of the committee on overhead distribution, of which H. W. Watt, electrical engineer Westchester Lighting Company, was chairman, was presented in the form of separate papers by the members of the committee. Attention was called to the need of more accurate determination of the rupturing capacity of fuses, especially for underground service, by W. F. Butcher, who presented tables listing the ratings of various makes of fuses as well as the size of fuses used on transformers by five companies. H. S. Chartier pointed out that maps of overhead systems must be readily intelligible to every one who has occasion to use them; they must be easily made and not difficult to maintain, and they must be in easily accessible places and protected from dust and exposure. One method of meeting these needs was outlined.

Essential requirements in the design of three-phase, four-wire distribution systems were discussed by J. O. Montignani, Westchester Lighting Company, who contended that general interconnection of alternating-current mains has not proved practicable. Furthermore, he held, distribution circuits should not be allowed to ramble off from the territory assigned to them. Attention was called to the fact that the inductive reactance of No. 2/0 wire is about one and one-half times the ohmic resistance at 18 in. separation. In arranging the wires on cross-arms a definite and systematic plan should be followed and insulators of somewhat higher rating than the voltage of the line should be used. Economical alternating-current distribution, declared Mr. Montignani, requires the use of secondary mains of as great a length as possible fed by larger transformers. To permit isolating trouble the branch circuits should be provided with suitable cut-outs. The value of installing lightning arresters on distribution transformers was also emphasized.

Pole lines have not been sufficiently guyed in many places, C. W. Nickerson contended. He maintained that when a transmission line is constructed through open country and subjected to high wind pressure it should be guyed in both directions about every tenth pole. Tree guying was discouraged.

According to tests of poles reinforced with a concrete collar around the butt, newly reinforced poles give a strength at the ground line equal to, if not greater than, that of the original pole, L. B. Snyder asserted. Subsequently defects develop, however, such as shrinking of the pole within the concrete collar and resulting troubles from the accumulation of moisture. At best, this method only postpones replacement of the pole a few years, Mr. Snyder contended, and when replacement becomes necessary the added cost of removing and disposing of the concrete bases more than offsets the gain derived from the added life of the pole.

J. M. Howarth dealt with the economic loading of line transformers, and certain features of construction and operation which have a definite bearing upon the design of secondary systems were outlined by C. A. Bacon, Adirondack Power & Light Company. Mr. Bacon discussed methods of ascertaining the load to be handled, the effect of demand and diversity factors on wire and transformer sizes and approximate methods of calculating residential consumers' demand.

Operating a transformer underloaded is an inefficient utilization of the investment represented and is, furthermore, productive of low power factor and excessive core loss, declared Chairman Watt. Hence it should be avoided as much as exceeding the upper temperature limitation. Five methods of determining the loading of transformers were discussed, namely, record of meter load, voltage tests during peak load, indicating ammeter and wattmeter readings on secondary, recording ammeter or wattmeter, and use of a thermal indicator. The combination of thermal indicator with recording ammeter and recording wattmeter was recommended.

### SECTIONALIZING SWITCHES USED

In discussing the reports on overhead distribution W. G. Blackwood said that branch circuit cut-outs are not used by the New York & Queens Company because troubles on a circuit will interrupt service. Instead sectionalizing switches are used. Banking of transformers has been successfully employed on overhead and underground circuits for several years, expulsion fuses being used in the secondaries of small transformers and oil switches with large ones.

E. P. Peck spoke of the use of a common neutral for every purpose in Minneapolis. The system of the city is grounded at every possible point, considerable money being thereby saved. There is not much trouble in banking transformers, he said, if fuses rated at four times normal current are used in the primary or secondary side of the transformers.

The smallest transformer fuse used by the Brooklyn Edison Company, according to R. A. Paine, Jr., is 50 amp. With 50-kw. and 75-kw. transformers 75-amp. fuses are used and for 100-kw. transformers 100-amp. fuses are used. In specifying sizes of transformers that can be mounted on poles, he said, it is preferable to speak in terms of weight, rather than rating.

With three-phase, four-wire systems more tree trimming and more tree wires are required to insure uninterrupted service, H. W. Watt observed. W. C. Blackwood said that to insure economic loading of transformers the New York & Queens Company takes graphic readings at different periods. During the intervals the number of apartments, stores, etc., connected is recorded. Transformers of 25 kw. and larger have thermal indicators.

### UNDERGROUND SYSTEMS

Nine questions are to be specially investigated by the underground systems committee during the coming year, according to the announcement of R. A. Paine, Jr. They are conduit and manhole construction, manholes for transformers rated at 100 kw. and above, the best loading for cables, fireproofing cables, type of cables for four-wire three-phase systems, primary cut-outs for subway transformers, primary fuses or "disconnects" for underground lines, secondary distribution circuits (fused secondaries, single versus banked transformers, networks), and joints for high-tension cables. A. Hussey, Brooklyn Edison Company, presented a paper commenting on these and other subjects.

T. R. Eilenberg, New York & Queens Electric Light & Power Company, referred to some new manhole construction which has been adopted, new-type cable hangers and new distribution boxes which facilitate the location of trouble.

Creosoted-wood ducts are being used for primary and secondary services very successfully, Mr. Paine asserted. He referred to single-conductor, 45,000-volt cable with 20/32-in. paper insulation being installed by the United Electric Light & Power Company between the Sherman Creek station and the Hell Gate station, a distance of 11 miles. An installation of single-conductor, 66,000-volt cable with 30/32-in. paper insulation is being made by the Detroit Edison Company.

Experiences with high-voltage cable were related by W. F. Davidson, Brooklyn Edison Company, who called attention to the fact that ordinary compounds broke down in a relatively short time (thirty to fifty-five minutes) when 80,000 volts was applied between conductors and sheath owing to the formation of air bells in the compound. Petrolatum is now being used with much better results. The question is whether it will stay in the joints. It is possible that reservoirs may be required to keep the joints filled. Joints filled with this compound have been operated at 120,000 volts, three-phase, and 95,000 volts between conductors and sheath for seventy hours without failure, with "Conducell" partitions around the joints and no hand wrapping.

### RURAL SERVICE SITUATION

Rural service should be developed along such lines that it will be self-supporting, declared W. J. Reagan of the Utica Gas & Electric Company. He contended that the rural charge should be equal to the urban charge plus an excess charge equal to the additional expense of furnishing rural service.

## Clarion River Equipment

**Half of Apparatus for Piney Plant Now Ordered—Potential Development Reaches 400,000 Hp.**

THE first order for electrical equipment for the Clarion River project of the Penn Public Service Corporation has been placed by the General Construction Corporation with the Westinghouse Electric & Manufacturing Company and consists of two 12,000-kva. vertical waterwheel generators with transformers and switching equipment. This equipment will be installed in the Piney Creek power house, which will be the first of the three generating stations in the project to be put in operation. It is expected that this plant will be ready in 1923.

The plans for the Clarion project call for the construction of three dams and generating plants. One of these, known as the Foxburg development, is to be about two miles from the mouth of the Clarion River, which empties into the Allegheny 60 miles north of Pittsburgh. The second, the Piney development, is about 24 miles upstream. The third is still farther upstream, about 6 miles above the town of Clarion, Pa., and is known as the Mill Creek development. The dam at Piney will be about 75 ft. high, that at Foxburg about 175 ft. and that at Mill Creek about 250 ft.

The ultimate installation at Piney will be 44,000 hp., at Foxburg 88,000 hp., and at Mill Creek 130,000 hp. One half of the apparatus for the Piney plant is included in this first order.

The Clarion River is formed by the union of two branches 90 miles north of Foxburg and is fed by many other tributaries in its drop of 500 ft. to the Allegheny. Its total drainage area is 1,257 square miles, most of which is unsettled and unimproved forest land. When completed, the project will impound about 47,550,000,000 cu.ft. of water in the watershed of the Clarion River and its lower tributaries, a volume sufficient to develop 400,000 hp. of electrical energy. A total expenditure of about $28,000,000 will be necessary to complete the project. It is proposed to use the electric power for the industrial development of northwestern and western Pennsylvania and regions in eastern Ohio.

## Ford Reveals His Plans for High Dam Development

The formal application of the Ford Motor Company for a license covering the High Dam project at St. Paul was filed with the Federal Power Commission on May 22 by J. H. Manning, the managing engineer for Stone & Webster. This action is in pursuance of the terms of the preliminary permit which the Federal Power Commission granted the Ford Motor Company after the hearing held on March 2.

The application for license was accompanied by detailed plans of the development which appear to have met the commission's approval. Under the law these plans must be approved by the Secretary of War and the Chief of Engineers as well, because of the relationship between this project and navigation structures.

It will be necessary to cofferdam off the structure and make slight modifications in the original concrete to allow for the newer types of machinery which will be installed. In addition, the power house must be built and the necessary transmission equipment installed. The plans of the Ford company include a steam plant which is to be erected adjacent to the hydro-electric plant, or possibly may be housed in the same building.

## Municipal Ownership Mayor Elected in Denver

Ben F. Stapleton was elected Mayor of Denver on May 15 over D. C. Bailey in a bitterly contested fight in which municipal ownership of utilities played a chief part. Mr. Bailey, the present Mayor, had opposed the idea of the municipality acquiring its utilities. Mr. Stapleton, who had Governor Sweet's support, favored it, though not so unequivocally as five other candidates who went to defeat along with Bailey. Stapleton explained his platform as "the protection of the city's interests in the operation of public utilities and purchase of such utilities as can be purchased at a price which will permit the people to operate them advantageously." By the Denver charter all questions of franchises and ownership of public utilities must be submitted to the voters. Such a vote cannot be held for three years, but the newly elected Mayor's term will not have expired then.

## General Goethals Is Called in at Colorado Springs

The long-continued argument between the city of Colorado Springs and the Colorado Springs Light, Heat & Power Company over the amount of power that can be derived from the Pike's Peak watershed entered on a new phase recently when the city engaged G. G. Anderson, a Los Angeles engineer, to make a report. Mr. Anderson sustained the city's contention that there was sufficient water power obtainable to make it possible to supply the city from a strictly hydro-electric plant. This contention is disputed by the central-station company, which maintains that it will be necessary to have a steam station in reserve. In an endeavor to settle the question, the company has engaged Gen. George W. Goethals to survey the watershed and submit a finding.

On June 12 the voters are to pass upon the renewal of the company's franchise. If it is finally determined that no steam plant is necessary, the city plans to charge the company $100,000 annually for the use of the water. At present the company generates by both water and steam power.

## Johns Hopkins in Line

**Follows Trend of Engineering Education by Establishing New Arts Course for Technical Men**

THROUGH co-ordination between the Johns Hopkins School of Engineering and the College of Arts and Sciences it is planned to establish at the Baltimore university next October a preliminary arts course for students who expect to take later courses in mechanical, electrical, civil, chemical or gas engineering.

The new course will extend over a period of three or four years, depending upon the student's ability, after which he will be allowed to complete a regular engineering course in two additional years. The student will receive the degree of bachelor of arts at the end of his pre-engineering course and the regular bachelor of engineering degree upon completion of the two-year technical course.

The plan virtually tends to establish engineering training at Johns Hopkins upon a graduate basis, Dr. John B. Whitehead, dean of the engineering school, said, although it will not establish the pre-engineering course as a requirement for entrance to the engineering school and the regular four-year undergraduate courses in engineering will be continued as heretofore.

"The new course," Dr. Whitehead said, "has been arranged with special reference to the increasing demand for engineers who, in addition to the professional training, shall also have some knowledge of literature, history, modern languages, economics, business, other sciences and in general of those subjects usually understood as being part of a liberal education. It is now generally recognized that the larger undertakings of modern business and social enterprise require for their proper execution engineers who shall have as wide a knowledge as possible of social, political and economic affairs. A broad education is essential for this knowledge, and these courses are arranged with this purpose in view."

## Detroit May Purchase Generating Equipment

Although the Detroit City Council, which recently voted to award contracts to the Westinghouse Electric & Manufacturing Company for four 20,000-kw. turbo-generators, has rescinded this action, it is said to be likely that the city will eventually buy two, or possibly three, turbines to generate the 35,000 kw. or 40,000 kw. additional energy that it needs for lighting and pumping purposes and in the operation of the municipal railway. At present the city is generating about 19,000 kw. for these purposes and purchasing the rest from the Detroit Edison Company. It is the plan of the city administration to generate all the power needed for municipal uses, but not to compete with the central-station company in the supply of private customers.

## Against Excess Varieties

**Their Elimination Chief Topic of Discussion Among Jobbers at Hot Springs, Va.**

PROBLEMS involved in the elimination of obsolete, duplicate and other excess varieties from jobbing lines were the principal topics of discussion in the committee meetings and about the hotel at Hot Springs, Va., this week, when the Electrical Supply Jobbers' Association met for its fifteenth annual convention, meetings of the executive committee beginning on Monday and the convention proper on Wednesday. There was an unusually large attendance of both jobbers and manufacturers. No detailed recommendations are available as the ELECTRICAL WORLD closes its forms, but definite suggestions are expected which will clearly indicate the attitude of the jobbers on this subject.

E. W. Lloyd, chairman of the Joint Committee for Business Development, addressed the first session, and addresses by W. A. Durgin of the Department of Commerce, Congressman Clyde Kelly of Pennsylvania, C. G. Frang of the Apex Electrical Distributing Company, Cleveland, and J. Clyde Marquis, Department of Agriculture, were scheduled for Thursday.

A resolution was passed by the association in executive session to discontinue the separate meetings of the Central and Atlantic Divisions and to recommend that the Pacific Division hereafter hold but three meetings each year. O. Fred Rost was elected chairman of the Atlantic Division and W. R. Herstein chairman of the Central Division to serve for the ensuing year. The following were chosen to represent the divisions on the association's executive committee: Atlantic Division, E. C. Graham, V. C. Bruce Wetmore; Central Division, W. W. Low, George W. Johnson.

## Pacific Coast Jobbers Hear from Central-Station Men

Commercial managers of several of the large power companies of the Pacific Coast were present at the regular quarterly meeting of the Pacific Coast Jobbers' Association held at Del Monte, Cal., May 10 to 12. The credit men's association held their annual meeting at the same time, and one joint evening meeting was held at which several papers were presented. The credit men spoke of the upward trend of prices and the shortage of materials and warned against the fictitious activity that will result from the pyramiding of orders. At the open meeting Saturday morning central-station men told of the progress of the various cooperative movements on the Pacific Coast. A. E. Holloway, sales manager of the San Diego Consolidated Gas & Electric Company, told of a code of ethics which has been distributed among the contractor-dealers of San Diego and the success with which this movement is meeting. The next meeting of the jobbers' association will be held in the Northwest, probably in Portland, during the early part of September.

## Effort to Abolish Tennessee Commission Fails

Efforts to abolish the Public Utilities Commission of Tennessee have so far proved unsuccessful, the Legislature of the state having adjourned without passing an act of repeal. As reported in the ELECTRICAL WORLD at the time, Governor Peay on March 20 sent to the Legislature a special message advocating repeal. The House by a majority of seventy-four to thirteen had already voted for this course, but the Senate tabled the bill by a vote of eighteen to eleven.

At the hearing before the public utilities committee of the Senate the Mayors and the City Attorneys of Memphis and Chattanooga advocated repeal, while the officials of Nashville and Knoxville took an opposite view.

A bill increasing the personnel of the commission to five and adding a special lawyer to serve as counsel for cities and consumers passed the Senate, but was not brought up for consideration in the House.

## Conference Is Against Inclosing Attrition-Mill Motors

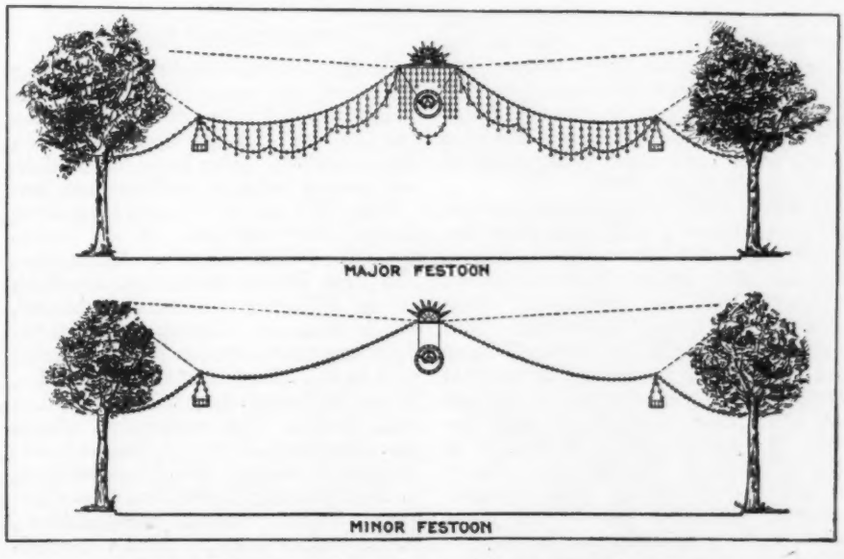
That squirrel-cage motors directly connected to ball-bearing attrition mills should not be inclosed was the finding of a recent conference composed of representatives of the Mutual Fire Prevention Bureau, the Electric Power Club and the attrition-mill manufacturers. It was held that rules must be based on facts and past experience rather than on the idea of trying to prevent something that may happen, and the point was made that the hazard with an inclosed ventilated motor or totally inclosed motor of ordinary construction might be greater than with the open-type squirrel-cage motor. No tests have been made to determine the relative factors of safety of the different types of construction. Experience, however, was held to have shown that the open-type squirrel-cage motor used on attrition mills for the last ten years has been satisfactory.

## Washington to Have Elaborate Electrical Display

Electrical decorations and special illumination for the streets of Washington for the convention of the Knights of the Mystic Shrine, to be held June 5, 6 and 7, will cost approximately $75,000, including installation. The principal display will be along Pennsylvania Avenue. From the peace monument at the Capitol to the Treasury Building, a distance of about one mile, the avenue will be illuminated by five major and fifty-eight minor displays. The major displays will consist of two ropes of lights across Pennsylvania Avenue, with lace effects between, a starburst and illuminated picture in the center and a design near each end. The lights will be red, green and yellow. Each major display will contain 700 lamps. The minor installations will consist of a single rope, with design in center, and each containing 350 lamps.

On Pennsylvania Avenue in front of the White House, where reviewing stands will be erected and the "Garden of Allah" created, there will be special floodlighting. In front of the Union Station a large electrical design, 30 ft. x 60 ft., is to be erected.

Poles have been set in Pennsylvania Avenue for the special installations and the underground power lines of the Potomac Electric Power Company will be tapped. The illumination will be used from May 26 to June 10. Plans prepared by the Westinghouse Lamp Company, slightly modified to meet financial needs, are being followed, and 25,000 Westinghouse "Mazda" lamps are to be installed.




OVERHEAD ELECTRICAL DISPLAYS FOR WASHINGTON CELEBRATION

## Texas Associations Unite

**Technical, Commercial and Accounting Discussions Fill Electrical and General Sessions at Fort Worth**

DISCUSSING the methods used in changing 2,300-volt, single-phase and two-phase overhead lines to 4,000-volt, three-phase, four-wire, John Oram of the Dallas Power & Light Company pointed out, in a paper presented at the Fort Worth convention of the Southwestern Public Service Association last week, the advantage the latter system possesses in making use of 2,300-volt transformers previously installed. In changing polyphase circuits the changes are best begun in the outlying districts, he said, but with single-phase groups it makes little difference where the beginning is made. With a four-wire, two-phase system everything can be got ready while operation is continued at 2,300 volts, and the change can then be made in convenient steps, the noon hour having proved a good time to make cut-overs. Mr. Oram dwelt on the necessity of keeping proper clearances between conductors and structures and in climbing spaces on such cut-over lines and recommended that standard construction drawings be prepared for the guidance of the line crews. He pointed to the flexibility of the four-wire, three-phase circuits in providing any desired service through transformer connections recognized as standard and to the possibility of using special connections where these are necessary.

### Operating Problems

Secondary and lightning-arrester grounds received attention in the round-table discussion of utility engineering and operating problems, and it was brought out that the Texas Power & Light Company has found 1-in. x 8-ft. ground rods more satisfactory in providing good grounds than the usual pipe where there are no water systems to use for grounding purposes. This is due to the greater tendency of pipe to corrode.

J. B. Thomas said that the ground rods used had pigtails attached at the factory, and the tendency on the part of line crews was to drive them full length into the ground, whereas if pipe is used the tendency is to saw the pipe off at some convenient point short of permanently moist earth.

It was stated in the discussion that the grounding of transformer cases has been abandoned in some instances because safety and accident prevention authorities felt that ungrounded cases were less of a hazard to linemen. That the practice would be resumed later was the opinion expressed by several who felt that grounded cases are less hazardous than ungrounded ones because the grounds are a protection in case of contacts between the primary circuits and the cases. The abandonment of grounded transformer cases has brought a reduction in the number of bushing failures, though this was attributed in part at least to the possibility that defective bushings would continue in operation for some time where the cases were ungrounded, while with grounded cases prompt breakdowns would occur.

The use of covering on line wires gave rise to a lively discussion, the opinion of the meeting being that as a means of showing the public and the legal authorities that bare wire is the safer practice on circuits of 2,300 volts and higher it should be actually used wherever possible.

### Broad Functions of Arkansas Information Committee

Earl W. Hodges, director of the Arkansas Committee on Public Utility Information, proclaimed as the real foundation of utility prosperity good public relations. He said that in Arkansas it had been decided that development of the state resources was one of the important duties of his committee, and to that end efforts have been directed toward establishing relations with all kinds of societies in the state, including industrial, legal, ministerial, educational, civic and social.

In the Accounting Section meetings on Wednesday and Thursday customers' record and billing methods, preservation of records and budget estimates and analyses were discussed. Machine billing methods were the main subject under this heading. In the matter of preserving records it was felt that the general records should be preserved indefinitely. Supporting records should be preserved at least until an audit is made. It was shown that utility commission requirements influence the time of preservation of such records and that in the case of bills-payable records and other records of this character property appraisals at any time in the history of the property might make such records invaluable. Careless methods of filing in the past were shown to have made it difficult to use records even where they had not been destroyed.

Ice plants and power sales to them received attention in the Commercial Section on Thursday.

### Amalgamation Effected

At the business session on Thursday afternoon the amalgamation of the Southwestern Public Utility Association and the South Central Gas Association was completed. This brought the light and power, electric railway and gas utilities of Texas all into the same association under the name of the Southwestern Public Service Association. The Fort Worth convention, at which nearly 450 delegates were registered, was a joint one. The chairman of the light and power section for the coming year is H. E. Borton of the Calvert Ice, Water & Electric Light Company, Calvert, Texas. The association officers are: President, J. H. Gill, Dallas Power & Light Company; first vice-president, C. B. McKinney, Lone Star Gas Company, Dallas; second vice-president, H. E. Borton, Calvert; third vice-president, George I. Plumber, Dallas.

## Pelton Wheel Built to Resist Dilute Sulphuric Acid

An engineering problem of more than ordinary interest has been worked out by the Pelton Water Wheel Company's Atlantic department in a contract just awarded for new hydraulic equipment by the city of Manizales, Republic of Colombia. This little city of the high Andes is more than a hundred miles from the railroad, and designs for a complete 500-hp. power-house installation have had to be worked out in sectional form to permit transportation by wagon, muleback and aërial tramway over mountain passes.

This, however, was not the only problem involved. The mountain torrent supplying power for the Manizales municipal light station, situated at the bottom of a deep canyon, is strongly impregnated with sulphuric acid. This has been traced to a subsurface flow through a stratum of volcanic rock extending far up the slopes above the city. So far as known, the Manizales plant is the only one in the world which runs on dilute sulphuric acid. Naturally no ordinary impulse wheel would last long in such service, as the acid would eat away every bit of steel with which it came in contact in a comparatively short time.

The Pelton design, consequently, had to be worked out on a basis permitting the use of bronze, brass and monel-metal, instead of steel, at every point that would be exposed to the water. This was successfully accomplished, as was the companion task of sectionalizing the entire equipment for transportation in small pieces and assembling on the spot, without prejudice to the strength or efficiency of the whole installation. The turbine except for these features is a standard type of Pelton impulse wheel. It will work on an effective head of 250 ft. and will be connected with a General Electric 350-kva. 60-cycle three-phase generator. The entire hydraulic installation and all auxiliaries will be built in the I. P. Morris Department shops of the William Cramp & Sons Ship & Engine Building Company, at Philadelphia.

## Utility Information Bureau Set Up in Pennsylvania

As foreshadowed in the notice of the preliminary meeting for that purpose of Pennsylvania public utility executives published in the ELECTRICAL WORLD of April 7, the Pennsylvania Public Service Information Bureau has been established for "the timely assembling and dissemination of reliable information relating to the commonwealth's public utilities." Electric light and power companies, electric railways, telephone companies, gas companies and water companies are behind the committee, of which P. H. Gadsden, vice-president United Gas Improvement Company, is chairman, and Walter H. Johnson, vice-president Philadelphia Electric Company, a prominent member. Headquarters are in Philadelphia.

# Brief News Notes

**New Municipal Ownership Provision in Wisconsin.**—The Teasdale bill has finally become a law in Wisconsin following its approval by Governor Blaine. It provides that no municipality that has acted to acquire privately owned electric light and power, street and interurban railway, gas or water systems may discontinue such action within thirty days after the commission has announced the necessary compensation for the properties to be taken over.

**San Francisco Installing 80,000 Kw. in Four Units.** — Generators for the Moccasin Creek power house of the city of San Francisco have been shipped from the factory of the General Electric Company at Schenectady, N. Y. Four units of 20,000-kw. rating each are to be installed. The new power house to contain this equipment will be of steel and reinforced concrete. It is planned to have the plant in operation within eighteen months.

**New River Project Must Be Readvertised.**—The Virginian Power Company has created a subsidiary to be known as the West Virginia Power Company. This subsidiary is intended to carry out the proposed development on New River. The change in name will make necessary the readvertisement of the preliminary permit for which the Virginian company applied. The advertisements, under the law, must be spread over a two-month period.

**Holtwood-York Transmission Line Nearly Finished.**—The transmission line which the Pennsylvania Water & Power Company is building from its generating station at Holtwood, on the Susquehanna River, to York, about 30 miles north, has been completed to within about a mile and a half of the substation which is to be built at Violet Hill, a short distance south of York. From this station energy will be supplied not only to York but also to Glen Rock, Red Lion, Railroad, Stewartstown and probably Spring Grove and Hanover.

**Standardization of Traffic Signal Colors.**—Forty-two men, representing the manufacturers and users of traffic signals, federal and state governmental departments, associations interested in the prevention of traffic accidents and representatives of the general public, are now drafting a national code on colors for traffic signals which it is expected will not only cut down the annual loss of life through traffic accidents but will eliminate many irritations to motorists and the operators of steam and electric railways. This work is being carried on under the auspices of the American Engineering Standards Committee. W. P. Blackwell of Newark, N. J., represents the National Electric Light Association and Clayton H. Sharp the Illuminating Engineering Society.

**Muscatine Company Changes Name.**—The Muscatine Hydro-Electric Power Company has amended its articles of incorporation to change its name to Eastern Iowa Power Company. Work began on May 1 on the dam which the company is erecting across the Maquoketa River at Muscatine, and it is expected that the plant will be ready for operation by Dec. 1.

**American Power & Light Company Pays Stock Dividend.** — The American Power & Light Company has, in addition to its regular quarterly cash dividend of 2½ per cent on its common stock, declared a dividend of 2 per cent payable in common stock. Both dividends are payable June 1 to stockholders of record May 19. This is the second holding company organized by Electric Bond & Share Company interests to pay stock dividends, the American Gas & Electric Company being the first.

**Giant Electric Sign for Standard Oil in St. Louis.**—A giant electric sign erected at a Standard Oil filling station just southwest of Forest Park in St.

Louis is said to be the largest double-faced sign in the world. It is 45 ft. high and 70 ft. long and is visible for a long distance either east or west. It is placed on sixteen concrete piers sunk 8 ft. in the ground. There are forty-two circuits and it requires five thousand lamps, varying in size from 10 watts to 100 watts, for its complete illumination. The words "Red Crown Gasoline" are outlined in red, the border lights are blue, and the remainder of the lights on the sign are white. The sign is illuminated from dusk to midnight each night. It was designed and built by the W. F. Williamson Advertising Service of St. Louis.

**Financial Success of St. Louis Electrical Exposition.**—The accounts of the St. Louis Electrical Board of Trade Electrical Exposition Company, under whose auspices the electrical exposition was held on March 12 to 17, show remarkable returns. The balance after all bills were paid enabled the company to pay to each exhibitor a sum equal to 24 per cent of the amount paid for rental of space and to return to each of the stockholders the amount he paid into the treasury at the time the company was organized.

**New Turbine for Okanogan Valley.**—The Washington Water Power Company, which recently acquired the property of the Okanogan Valley Power Company, has awarded a contract to the Pelton Water Wheel Company for furnishing a 2,500-hp. double-runner cylindrical-case reaction turbine, to operate under an 80-ft. head. This unit will be installed at the Similkameen River plant of the power company at Oroville, Wash. It will resemble in general design the Pelton turbine of the same capacity now operating at the plant, which was built for the Okanogan Valley Power Company in 1919.

**Utah Power & Light Shows Increased Earnings.**—Gross earnings of the Utah Power & Light Company for the twelve months ended Feb. 28 amounted to $7,338,990, an increase of $669,770 over last year. Net earnings after taxes totaled $3,670,866, compared with $3,205,190. Balance after preferred dividends was $1,184,547, an increase of $227,176.

**Charleston (W. Va.) Company Acquired by American Gas & Electric.**—The American Gas & Electric Company of New York has acquired the West Virginia Water & Electric Company of Charleston, W. Va., according to an announcement by A. C. Babson, general manager of the latter company. The West Virginia company supplies electric power and water to Charleston and surrounding territory. Details of the deal have not been made public. Electric light and power companies in Wheeling and in Logan, W. Va., are owned and operated by the New York corporation.

**Harvard Offers $1,000 Engineering Scholarship.**—A competitive scholarship of $1,000 has been offered by the Harvard Engineering School for the year 1923-24, to be open to seniors graduating in June from colleges or departments of liberal arts throughout the country. No student now in Harvard will be eligible for the competition, nor any student registered in any engineering or technical school. The award will be based on the complete academic record of the applicant, together with the result of a special three-hour written examination, including mathematics through calculus and general physics.

**Electrical Growth of Milwaukee.**—Milwaukee, according to a statistician of the Wisconsin Public Utilities Information Bureau, is rapidly becoming an electrical city. It is neck and neck with Pittsburgh in the use of the electric furnace for steel making and other metal melting and is a large user of electrical energy for japanning and similar purposes. To meet the demands of the city and the surrounding territory, including Racine, Kenosha and other places within a radius of about 40 miles, there is now a minimum generating capacity of some 176,700 kw., to which may be added 10,000 kw. received from the Wisconsin River hydroelectric plants. To this will be added by the end of the year 30,000 kw. more in the unit now being installed in the big plant at Lakeside by the Milwaukee Electric Railway & Light Company. It is predicted that within a short time the electrical energy generated in the steam plants in and close to Milwaukee will exceed the total of the big water-power developments now under way in

the state, which is put at 353,000 hp. This estimate does not include any of the industrial plants still in existence.

**New Jersey Utilities to Combine.**—The Morris & Somerset Electric Company, the Commonwealth Electric Company and the Lakewood & Coast Electric Company are to combine under the name of the Jersey Central Power & Light Corporation. New financing will consist of $3,500,000 in first-lien 6½ per cent bonds.

**Radio Signals of Standard Frequency.**—Radio signals of standard frequency are now being transmitted from the Bureau of Standards at Washington. These standard frequency signals are intended to be used for standardizing wavemeters and adjusting transmitting and receiving apparatus. The proper adjustment of such apparatus is particularly important in connection with the reallocation of waves as recommended by the second radio conference held in Washington in March. Methods for receiving and utilizing these signals for wavemeter calibration have been published in the *Radio Service Bulletin*, and more detailed information may be obtained upon application to the Bureau of Standards. The announced values of these signals are accurate to better than three-tenths of 1 per cent.

**Cities Service Company in April.**—The statement of earnings of Cities Service Company for the twelve months ended April 30 showed gross earnings amounting to $16,003,548, which compared with $12,688,908 in the corresponding period of 1922. Net earnings were $15,528,247, as compared with $12,229,894, and net to stock was $12,989,007, as compared with $10,086,102. Net to common stock and reserves amounted to $8,050,881, as compared with $5,205,591 in the preceding twelve months. In the twelve-month period the preferred dividend was earned 2.63 times, as compared with 2.07 times in the twelve months ended with April 30, 1922, while the percentage earned on the average amount of common stock outstanding was 17.28 as against 11.20. Net to common stock and reserves for the month of April, 1923, was $1,043,426, which compared with $752,462 earned in April, 1922.

**Engineers to Study New Power Codes.**—Two power test codes, part of a group of nineteen being framed as aids to industry by 125 engineers, scientists and educators under the auspices of the American Society of Mechanical Engineers, will be discussed at a public hearing in connection with the society's spring meeting at Montreal next week. For more than four years nineteen committees, representing practically every industrial center, have been engaged in this work, directed by a main committee of twenty-five. One of the codes to be considered at Montreal relates to instruments and apparatus for measuring physical and chemical quantities in connection with tests of power equipment. The second code deals with internal-combustion engines of all forms, but is limited to the engines alone. Sizes of internal-combustion engines coming within this code range from one to several thousand horsepower.

**Electricity in the Poultry Yard.**—The Department of Agriculture is officially advising poultry raisers of the benefits to be gained from electricity in their business. It recounts an experiment in which one 75-watt lamp was in a room housing fifty pullets for two and one-half hours daily for 140 days with excellent results. It was turned on automatically at 4.30 a.m. and allowed to run until daylight. When the light is used in the evening arrangement has to be made for dimming before the current is switched off entirely so that the hens will go to roost before total darkness prevails. The department also points out that a good way to keep water in the poultry yard from freezing during the winter is to cover a carbon-filament lamp with black cloth and submerge it in the drinking pan.

**Germany Turning to Large and Interconnected Plants.**—Existing conditions in Germany are forcing out of business the coal-burning power plants with high operating costs, according to a report recently received by the Department of Commerce. Such stations have had great difficulty in obtaining the necessary credit for extensions and new equipment. Difficulty in procuring coal has added to their troubles. The result has been a further concentration of power production in the larger and more efficient stations. This is stimulating interconnection, and as a result lower rates to consumers have been made possible. A very lively interest is being manifested in the conversion of some of the larger central stations from steam power to water power. The matter has been taken up with both German and foreign bankers, but because of the very large amounts involved no great amount of encouragement has been forthcoming.

## Associations and Societies

**Taylor Society's June Meeting.**—The Taylor Society, which has for its objects the promotion of the science and the art of administration and of management, will meet at the Hotel Onondaga, Syracuse, on June 7, 8 and 9 to listen to papers and inspect industrial planning departments.

**Baltimore Section, A. I. E. E.**—Prof. W. B. Kouwenhoven was elected chairman of this section at its meeting last week, F. T. Leilich vice-chairman and R. T. Greer secretary. Earl A. Anderson of the National Lamp Works spoke on illumination in office and factory buildings.

**Cheyenne Electric Club Organized.**—Electrical men in Cheyenne, Wyo., have recently completed the organization of the Cheyenne Electric Club with the purpose of bettering the electrical industry in the Wyoming city. The members will discuss electrical problems and educate the public concerning them.

**National Association of Manufacturers Elects Officers.**—John E. Edgerton of Lebanon, Tenn., president of the National Association of Manufacturers, was re-elected to office for another year in the closing session of the New York convention last week, as were also Henry Abbott of New York City, treasurer, George S. Boudinot, secretary, and Earl Constantine, New York City, assistant to the president.

**Nominations for Governors of A. M. E. S.**—In accordance with the constitution the nominating committee of the Associated Manufacturers of Electrical Supplies has selected as nominees for vacancies on the board of governors, to be voted upon at the annual meeting of the association during the week of June 25, S. B. Condit of the Condit Electrical Manufacturing Company, Boston; A. G. Kimball of Landers, Frary & Clark, New Britain, Conn.; W. W. Mumma of the Robbins & Myers Company, Springfield, Ohio; M. C. Rypinski of C. Brandes, Inc., New York City, and F. T. Wheeler of the Trumbull Electric Manufacturing Company, Plainville, Conn.

### Coming Meetings of Electrical and Other Technical Societies

[A complete directory of electrical associations is published in the first issue of each volume. See Jan. 6 issue, page 78, for latest list.]

American Society of Mechanical Engineers—Montreal, May 28-31. C. W. Rice, 29 West 39th St., New York.

Westinghouse Agent-Jobbers' Association—Hot Springs, Va., May 28-June 2.

National Electric Light Association—New York, June 4-8. M. H. Aylesworth, 29 West 39th St., New York.

California State Association of Electrical Contractors and Dealers—Dorner Lake, Cal., June 9-16.

Electric Power Club—Hot Springs, Va., June 11-14. S. N. Clarkson, Kirby Bldg., Cleveland.

Pacific Coast Electrical Association—San Francisco, June 19-22. S. H. Taylor, 527 Rialto Bldg., San Francisco.

North Central Division, N. E. L. A.—Minneapolis, June 20-22. H. E. Young, Minneapolis General Electric Company.

Society for the Promotion of Engineering Education—Ithaca, N. Y., June 20-22. F. L. Bishop, University of Pittsburgh.

Canadian Electrical Association—Montreal, June 20-23. Louis Kon, 65 McGill College Ave., Montreal.

American Institute of Electrical Engineers—Annual convention, Swampscott, Mass., June 25-29; Pacific Coast convention, Del Monte, Cal., Oct. 2-5. F. L. Hutchinson, 33 West 39th St., New York.

American Society for Testing Materials—Atlantic City, June 25-29.

Iowa Section, N. E. L. A.—Mason City, June 26-29. M. A. Linn, Des Moines Electric Co., Des Moines.

Associated Manufacturers of Electrical Supplies—New London, Conn., June 26-29. Frederic Nicholas, 30 East 42d St., New York.

National Council Lighting Fixture Manufacturers—Buffalo, June 26-28. C. H. Hofrichter, 233 Gordon Square Bldg., Cleveland.

Northwest Electric Light and Power Association—Seattle, June 27-30. G. E. Quinan, 204 Electric Bldg., Seattle.

Ohio Electric Light Association—Cedar Point, July 10-13. D. L. Gaskill, Greenville.

New England Division, N. E. L. A.—Swampscott, Mass., Sept. 6-8. Miss O. A. Bursiel, 149 Tremont St., Boston.

Michigan Electric Light Association—Grand Rapids, Sept. 11-13. Herbert Silvester, Detroit Edison Co., Ann Arbor.

Rocky Mountain Division, N. E. L. A.—Glenwood Springs, Col., Sept. 17-19. O. A. Weller, 900 15th St., Denver.

Association of Iron and Steel Electrical Engineers—Buffalo, Sept. 24-28. J. F. Kelly, 513 Empire Bldg., Pittsburgh.

# Recent Court Decisions

**Supreme Court Again Finds that Cost of Reproduction New Must Be Considered in Valuation Proceedings.**—Rates for public service corporations which fail to take into consideration the cost of reproduction at prevailing prices were disapproved by a decision rendered by the United States Supreme Court this week in the case of the Southwestern Bell Telephone Company vs. Missouri Public Service Commission. "It is impossible," the opinion said, "to ascertain what will amount to a fair return upon properties devoted to public service without giving consideration to the cost of labor, supplies, etc., at the time the investigation is made. An honest and intelligent forecast of probable future values, made upon a view of all the relevant circumstances, is essential. If the highly important element of present costs is wholly disregarded, such a forecast becomes impossible. Estimates for tomorrow cannot ignore prices of today." It must never be forgotten, the court added, "that while the state may regulate with a view to enforcing reasonable rates and charges, it is not the owner of the property of public utility companies and is not clothed with the general power of management incident to ownership." A separate opinion by Justice Brandeis, in which Justice Holmes concurred, asserted that advocates of reproduction cost as an element of rate making would find its application harmful to the public utilities when the cost of material and wages was lower. Justice Brandeis suggested as a preferable basis the money invested in the enterprise. Urging the court to "lay down a rule which will establish such a rate basis and such a measure of the rate of return deemed fair," he criticised his colleagues for leaving many of the elements to be determined by the opinion of experts, instead of making rates dependent upon ascertainable facts. While agreeing that reproduction costs as an essential element in rate making are better than the old tests—selling price or net earnings—the minority insisted that "where the financing has been proper the cost to the utility of the capital required to construct, equip and operate its plant should measure the rate of return which the Constitution guarantees opportunity to earn." Such a rule, it added, would make rates based on facts and not on opinion. Under the rule the court adopted, the value for rate-making purposes, the minority insisted, "must ever be an unstable factor." The public utilities would try to make the court adopt reproduction cost or prudent investment as the measure of rates according to which was the higher at the time that valuation proceedings were under way.

**Milldam Owner Willfully Diverting Water of Natural Stream Liable for Damages.**—In a suit brought by one McKee against the Nebraska Gas & Electric Company damages were sought on account of the action of the company in diverting the waters of the Cedar River at Fullerton in order to save its power plant, threatened with destruction by a rise in the river, from which by means of a dam the company derived power to operate its turbine wheel. As a result of this change in the course of the stream the plaintiff claimed that heavy rains had on these occasions caused his land to be flooded, live stock to be drowned and crops to be destroyed. The Supreme Court of Nebraska sustained the trial court in finding for the plaintiff, maintaining that the good faith of the defendant in believing its action necessary to preserve its own property and the absence of negligence or malice could not absolve it from the liability to recompense those whose property had been damaged by its course. (193 N. W. 106.)*

# Commission Rulings

**Savings from Improvement in Street Lamps Divided Equally Between Utility and Municipality.**—A franchise granted the Marshall Ice & Power Company by Martinsville, Ill., confused watts and candlepower in such a way that the company stood to make a considerable saving on account of the improvement in the art of lighting. The Illinois Commerce Commission ordered that the saving should be divided between the utility and the municipality, holding that neither was responsible for the fact that it is possible "to secure the same quantity of light from the expenditure of 29 per cent less electrical energy."

**Reproduction-Cost Theory Criticised.**—In its valuation of the waterworks properties of the Newport News Light & Water Company, the Virginia State Corporation Commission criticised the theory of evaluating a property strictly according to reproduction cost. "Counsel for the city," said the commission, "comment on the fact that the strict reproduction-cost theory, vigorously opposed by railways and public utilities in the days when such cost was less than actual investment, has come into favor in times of high levels of unit prices. It is true that public regulation is a growing science and must change with the changing times. While some of the old methods of regulation may appear as dead as Tut-ankh-Amen, their relics may, in the cycles of time, again become the model of fashion and the object of public approval. . . . The commission believes that in this as in previous cases the determination should begin with pre-war values and appreciate them a reasonable percentage, so as to allow for higher price levels. To the sum thus arrived at there must be added the actual money since pre-war days honestly and prudently expended in the public service."

**Has a Public Utility Vested Rights?**—In its decision holding the Terre Haute, Indianapolis & Eastern Traction Company to be an existing and not a new light and power utility, and therefore entitled to extend its service and operate as a general electricity supply company within the city of Indianapolis, despite the protests of the two central-station companies established there (ELECTRICAL WORLD, April 21, page 942), the Indiana Public Service Commission made some general observations on the standing of public utilities in a community as follows: "Has a utility any vested right in a community? Can a utility claim a vested right in the increase of a city which has doubled its population within a short time? If a city extends its corporation lines, taking in a town having a utility operating efficiently within it, can the town utility be excluded at the request of the city utility? Can a utility in one town or community be excluded from rendering service in another? What influence do arbitrary lines bounding cities, towns and townships have on conditions affecting utility service? Would not the answer in each case depend upon the conditions in each community considered? Is there any other test that can be applied to all situations? Is it not *the* test? Those who embark in the operation of public utilities must, of necessity, be subjected to certain hazards of the business, the same as operators in other lines of commercial activity, and when the interest of any utility runs counter to the general public interest the utility must submit and the general public welfare must prevail, and this is true whether the condition is the result of any act of omission of the utility or not, because of the recognized principle that the interest of society in general outweighs the interest of any member or portion thereof, and that is the basic principle of laws regulating public utilities everywhere. Such laws, including the one under which this commission is operating, are enacted in the interest of the public welfare and not in the interest of the public utilities, except in cases where the protection against competition or confiscation works to the best interests of the general public, which involves, not cheap rates temporarily, but standard service for a reasonable remuneration for present and future needs, which includes opportunity, ability, financial support and readiness to render the required service. The commission is not unmindful of the fact that it is to the best interest of the public that utilities be protected against confiscation and destructive competition, and these considerations are constantly kept in mind."

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

# Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men
Engaged in all Branches of the Electrical Industry

## C. H. Howell Goes to Atlantic City

C. H. Howell, general manager and vice-president of the Ohio Service Company, has been transferred to Atlantic City, N. J., to take charge of the properties of the American Gas & Electric Company in that state. Mr. Howell had been stationed in Coshocton since 1912, when he became manager of what was at that time the Coshocton Light & Heating Company. Later other properties in that section of Ohio were merged into a single corporation, the present Ohio Service Company, and Mr. Howell was made manager. He is a past-president of the Ohio Electric Light Association and has a host of friends in electrical circles in that state.

**Julian C. Smith** has been elected president of the Quebec Railway, Light, Heat & Power Company, succeeding E. A. Robert.

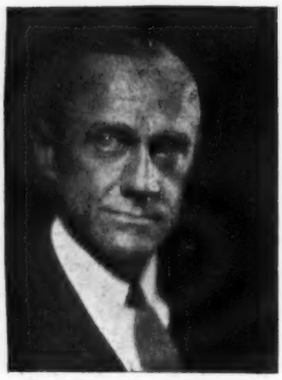
**Dr. Emmanuel de Margerie,** French exchange professor to the United States, was the guest of honor at a farewell luncheon given on May 18 at the Harvard Club, New York. Two hundred engineers attended and representatives of many of the leading colleges and universities were present. Dr. de Margerie has just finished a year of lecturing at Columbia, Cornell, Harvard, Johns Hopkins, Yale and Pennsylvania.

**O. M. Drischel,** manager of the Marion division of the Indiana General Service Company, has been appointed general manager of the company. Mr. Drischel has been associated with the company since its organization. The following changes are also announced: Roy Thurman becomes manager of the Muncie division, replacing O. E. Halderman, who goes to one of the Ohio properties, and T. M. Parker of Marion is transferred to the Hartford City (Ind.) division as manager, succeeding Henry Wallsmith, who is transferred to Benton Harbor, Mich.

**E. P. Peck,** general superintendent of the electrical department of the Utica (N. Y.) Gas & Electric Company, was unanimously elected chairman of the Electrical Section of the Empire State Gas & Electric Association at its meeting in Utica on May 18. Ever since going to New York State from the Georgia Railway & Power Company in 1919 Mr. Peck has been very active in the association. Most prominent among his recent committee activities have been the recommendations for standardization of transmission-line construction and his work as chairman of a committee that is endeavoring to solve the problems of greater interconnection of electric service systems within the state and in the adjoining territory. In the South, where Mr. Peck was superintendent of operation, tests and repairs, he became prominent for his original investigations and development work.

## Edmund Lang Elected President of Crocker-Wheeler

Edmund Lang, who was recently elected president of the Crocker-Wheeler Company, Ampere, N. J., succeeding the late Dr. Schuyler Skaats Wheeler, has been associated with the company since 1909, when he was selected to handle the many intricacies of the repair department, which had just been organized as an entirely separate unit from the main shop. His thorough and successful work so impressed the officers of the organization that in 1911 he was made purchasing agent.



EDMUND LANG

Two years later Mr. Lang was elected secretary of the company, and in 1915, when the office of sales manager became vacant, he was chosen to fill this post. Subsequently he was elected a director, and in 1919 he became senior vice-president and a member of the company's executive committee, devoting considerable time to administrative matters.

Mr. Lang was born in New York City in 1880 and inherited from his father, Charles F. Lang, who was for many years a manufacturer of steam engines and auxiliary machinery, a love of mechanics and engineering. He became associated with Arthur Schroeder, the New York sales agent for the Ætna Standard Iron & Steel Company of Martins Ferry, Ohio, in 1894, and in 1900 he entered the New York sales office of the American Steel Hoop Company, which later became a subsidiary of the United States Steel Corporation. When the sales department was removed to Pittsburgh Mr. Lang joined the force of Westinghouse, Church, Kerr & Company and later allied himself with the Keystone Electric Company, where he gained intimate knowledge of estimating and buying for the contracting and engineering branch of the business. In 1903 he joined the Wheeler Condenser & Engineering Company, but his desire for broadening his experience led him to organize in 1907 the Universal Engineering Company to build or reconstruct power and heating plants. Mr. Lang is a member of the Engineers' Club and is also vice-president and a director of the Curtis Gas Engine Company of New York.

**D. W. Roper,** underground cable superintendent of the Commonwealth Edison Company, sailed for Europe on May 19, to spend four months studying the foreign methods of cable manufacture and high-voltage distribution systems. His itinerary will include England, France, Italy and possibly Scandinavia and Germany. Other engineers of the company who sailed with Mr. Roper for the purpose of investigating European power-plant layouts were Secor Cunningham, Jr., B. G. Jamieson, Samuel Insull, Jr., and F. E. Goodnow of the Public Service Company of Northern Illinois.

**George A. Iler,** an electrical engineer of wide experience and a pioneer in the development of radio engineering, has been appointed electrical engineer of the Pennsylvania-Ohio electrical system at Wheeling, W. Va., succeeding C. A. Harrington, who recently resigned. Mr. Iler goes to Wheeling from Atlanta, where for the last year he was radio engineer for the Atlanta *Journal*, constructing and operating the big broadcasting plant of that paper. Mr. Iler is an Ohioan by birth and served for a time as electrician in the United States Navy. Following his naval service he devoted his energies to electrical work in various parts of the country in charge of construction and operation of power generating plants, transmission systems and general electrical engineering work, completing his education by a post-graduate course at the Georgia Institute of Technology. Among other important work in which he has been engaged are the building and operating of the first power-transmission lines for the General Electric Company in the New River coal district, W. Va., and the early application of electrical power to mining projects there, as well as the construction of the 100,000-hp. hydro-electric power plant at Atlanta for the Georgia Railway & Power Company. He early gave attention to the development of radio and for several years he was connected as consulting radio engineer with the Westinghouse Electric & Manufacturing Company.

# Manufacturing and Markets

Devoted to the Discussion of Business and Economic Problems of the Producer and Distributor, with Market Reports, Trade Activities, Foreign and Construction News

## Agencies Promoting Standardization

### An Outline of Association and Government Efforts to Stop Waste Throughout the World—Commercial and Engineering Sides Are Discussed

By C. E. Skinner
Manager of Research Department,
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MANY millions of dollars could be saved to the consuming public in the United States each year by proper standardization and simplification. Much has been done along this line and many agencies are at work, but the field is as yet little more than touched. Proper standardization requires that the standards adopted shall be satisfactory to all parties at interest and that progress be not arrested by such standardization. Very much of the standardization already accomplished has been a very great aid to progress, and further standardization and simplification can and will accomplish still greater things.

C. E. Skinner

In the electrical business we will probably never make our transformers or motors or generators to exact duplicate specifications, but there has been a constant trend to greater uniformity in rating and to the standardization of those things which tend to make apparatus interchangeable. The very rapid increase in the application of electricity to new fields requires an added complexity of apparatus to meet these demands. The stabilization of applications in many fields, the necessity for quantity production and the cheapening of the product are leading to the use of standards wherever standards can be applied.

The proper balance between standardization and development along new lines is very difficult to strike. Too much standardization tends to delay development; too much development along different lines in an industry tends to complication and excessive costs. The more rapid the development, the more difficult to adhere to standards and the greater difficulty of effecting standardization

The United States is pre-eminently the leader in machine-made products. This is due to the necessity for quantity production along so many lines, to the relatively high cost of labor, and to what has sometimes been described as our Yankee ingenuity in the development of such machine methods. From the standpoint of labor conditions, we face competition at the present time more difficult than ever before. The answer to this competition is quantity production and machine methods. These depend primarily on standardization. This explains, in some measure, the nation-wide movement evident in so many lines looking toward standardization. It may be profitable to review some of the agencies at work, their accomplishments and promise for the future:

**Standards Committee, A. I. E. E.**—Among the early movements for national standardization in the United States was the organization of a standards committee of the American Institute of Electrical Engineers. This standards committee has confined itself very largely to the standardization of those fundamentals underlying the design and performance of electrical machinery and has concerned itself little or not at all with that kind of standardization which results in duplicate parts and which is usually known as dimensional standardization. The work of the committee has been continued through a period of extremely rapid development in the electrical industry, and the committee has been quick to make those changes which have been necessitated by the growth in knowledge of the subject and in the development of the industry. Indeed, the standards committee work has brought about very important researches intended to settle points of dispute and points on which there was not adequate knowledge. A large volume of standards has been produced, and these standards are very closely followed in the manufacture of most electrical apparatus in the United States today. Its work has had an international bearing. It is substantially in accord with the electrical standardization in other countries.

**American Society for Testing Materials.**—One of the most active organizations in standardization in the United States is the American Society for Testing Materials. This society has to do with the standards for testing materials and the production of specifications which may be used in the purchase of materials. In the formulation of its specifications the society has from the very start followed the principle that both the producer and consumer, as well as independent interests, must be satisfied with any specification before it is adopted. As a result, many of the specifications now issued have required years of patient effort to bring all parties into harmony, and numbers of them have gone through considerable periods of probation before they were made final. Furthermore, provision is made for revision, whenever such revision may become necessary owing to change in the art or change in requirements.

#### Quality Standards Raised

As a result, purchasers of many kinds of materials utilize these specifications without change or they embody their requirements in their own purchase specifications. It is impossible to evaluate the influence for good which these specifications have had on industry generally. They have resulted in better materials, better understandings between producers and consumers; they have assisted in bringing about quantity production, and they have generally raised the standard of quality of the materials used in the particular industry for which the specifications are written.

**Society of Automotive Engineers.**—Perhaps in no other industry have both dimensional standardization and quality standardization been so essential to progress as in the automobile industry. Dimensional standardization was required because of the very large number of manufacturers and the enormous quantity of small parts required, such as screws, bolts, nuts, etc. The necessity for the production of a machine

which would stand the service required of an automobile and at the same time have minimum weight has required high-grade materials to a greater extent perhaps than any other device. It is certainly true that this standardization work has not been a hindrance in the development of new types of automobiles.

**American Society of Mechanical Engineers.**—The standards work of the American Society of Mechanical Engineers has been perhaps less extensive than that of the organizations already mentioned, but it has accomplished a great deal in the way of standardization. The Boiler Code of the American Society of Mechanical Engineers is the standard not only in the United States but in a number of other countries as well. The standards for machine screws have been quite generally adopted, and this society has on hand a number of other projects which will be of greater value when completed.

**Electric Power Club.**—Another organization which has been working along somewhat different lines is the Electric Power Club. This organization, composed entirely of manufacturers, has standardized more along commercial lines. It has dealt with sizes, ratings, interchangeability, testing and performance of electrical apparatus. The performance specifications of the Power Club have been very largely based on the standards of the American Institute of Electrical Engineers, the latter in the past dealing with what might be called engineering standards and the former with commercial standards. These two organizations are now working in the closest harmony in the further production of standards with regard to the rating of electrical machinery.

**National Fire Protection Association.**—The National Electrical Code, developed under the auspices of the National Fire Protection Association and with the co-operation of underwriters, contractors, manufacturers and interested organizations generally, is really a set of standards for the installation and use of electrical equipment to provide that such installations shall entail a minimum fire hazard. These standards are now generally recognized throughout the United States as satisfactory, and they have been adopted by many cities as municipal standards.

**United States Bureau of Standards.**—The Bureau of Standards was established under an act of Congress on March 1, 1901, and Section II of this act reads as follows: "That the functions of the bureau shall consist in the custody of the standards; the comparison of the standards used in scientific investigations, engineering, manufacturing, commerce, and educational institutions with the standards adopted or recognized by the government; the construction, when necessary, of standards, their multiples and subdivisions; the testing and calibration of standard measuring apparatus; the solution of problems which arise in connection with standards; the determination of physical constants and the properties of materials, when such data are of great importance to scientific or manufacturing interest and are not to be obtained of sufficient accuracy elsewhere."

One of the activities of the Bureau of Standards has resulted in the production of what is known as the National Electrical Safety Code. This is a set of standards which deals with the life hazard of electrical installations, just as the National Electrical Code deals with the fire hazard. This code is mentioned on account of its importance to the electrical industry and on account of the fact that it illustrates a type of standardization which is receiving a very great deal of attention throughout the country today.

**Division of Simplified Practice.**—The Department of Commerce, under its present Secretary, has organized what is known as the Division of Simplified Practice. It is recognized that many of our industries and many more of our businesses are suffering from too great a variety of almost every article of commerce in this country. It is the object of the Division of Simplified Practice to bring about, through agreement of the parties interested, a radical reduction in the sizes and varieties of commodities manufactured and sold in the United States.

## A Point for Co-operation

THIS very complete account of the accomplishments and future purposes of the agencies that are carrying on the work of standardization of industries in all parts of the world is particularly interesting to every division of the electrical industry, which, as shown by this article, is with the leaders in eliminating waste for both the manufacturer and consumer.

During the last two years, the period of most interest in carrying on the work of these associations and government bureaus, progress in eliminating excess varieties has been hindered by the fear of manufacturers that others making their lines would not follow suit and that orders would be lost in the markets where many unusual demands are made. It is hoped that this review of what all industries are doing to reduce waste of effort and materials will do much to direct the minds of the manufacturers, jobbers and purchasing agents along the straight road that leads to the storehouse of standardized products.

The above list comprises only a few of the bodies of national scope engaged in standardization for the industrial world. They should serve to illustrate both the tremendous interest in standardization at the present time and the evident value that such standardization must possess to industry in general.

While the organizations described are all of national scope, there has been no organization until recently which could rightly issue standards with the stamp of approval in such a way that they might truly be called American standards. This fact has been very forcibly brought to the attention of delegates who have attended various international meetings with the view of international standardization. The desirability for some organization which could put its stamp of approval on specifications and standards in such a way that they could be truly denominated as American specifications or American Standards led the standards committee of the American Institute of Electrical Engineers to suggest the organization of what has since become the American Engineering Standards Committee.

**American Engineering Standards Committee.**—This committee was organized by the four founder societies, i.e., the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers, together with the American Society for Testing Materials.

The organization work occupied approximately two years, and the organization committee attempted very carefully to go into every phase of the question so that the final organization might be truly representative of every branch of engineering which had to do with standardization. Provision was made for bringing into membership of the society all organizations which were of national scope and which were interested in engineering standardization. At the time of the organization of the A. E. S. C. there were more than one hundred organizations publishing engineering standards, most of which were formulated without systematic methods of co-operation between the organizations concerned. At the present time more than 160 organizations are actively co-operating in the work of the committee, having appointed accredited representatives on sectional committees.

For some years the unification and approval of existing standards will necessarily form an important part of the committee's work. The rules of procedure provide that: "Any standards adopted or in process prior to Jan. 1, 1920, may be approved by the main committee if, in its opinion, the standard has been developed by an organization and procedure substantially in conformity with these rules, or if it has, by actual practice, proved its right to become a standard," without the standards having gone through the machinery of a sectional committee. While the most satisfactory way of determining the status which a standard has in industry is to submit it to a duly organized sectional committee, there are cases in which such a full procedure would be considered a hardship. Hence the provision referred to. Before acting upon the approval of a standard submitted under this provision, a notice of its submission is sent to the technical press and to the industrial associations and technical bodies interested, requesting information as to the standard in meeting the needs of industry, and the matter is referred to a special committee for investigation. This special committee usually contains accredited representatives of those bodies which are most concerned with the standard, in order that the spirit of the sectional committee method may be carried out.

**Federal Specifications Board.**—This Federal Specifications Board has been set up as a part of the general scheme to promote economy and efficiency in

the routine business of the federal government. This board was organized under the authority of Circular 42, Bureau of the Budget, dated Oct. 10, 1921, in which it was stated that the establishment of the board was "for the purpose of co-ordination and economy in the procurement of materials and services used by the government under specifications prepared by the various branches thereof, to avoid duplication of effort and for the better utilization of industries."

The duties of the Federal Specifications Board are to compile and adopt standard specifications for materials and services and to bring the government specifications into harmony with the best commercial practice wherever conditions permit, bearing in mind the desirability of broadening the field of supply. Its work is being done under the leadership of the Bureau of Standards, and each interested department of the government has designated a representative to serve on the board. The circular establishing the Federal Specifications Board states that the specifications adopted and promulgated by the board shall be binding upon all and govern all departments and independent establishments of the federal government. These instructions were issued by the Director of the Bureau of the Budget, by the direction of the President.

The subject of standardization is receiving very serious consideration in practically all industrial countries. At the present time there are fourteen national standardizing bodies, including the American Engineering Standards Committee, in the United States. The countries having these national standardizing bodies are Austria, Belgium, Canada, Czechoslovakia, France, Germany, Great Britain, Holland, Italy, Japan, Norway, Sweden, Switzerland and the United States.

The oldest national standardizing body is that of Great Britain and is known as the British Engineering Standards Association, established in 1901. This association has to its credit the largest number of projects completed and probably the largest number of projects under way. It has more than twenty-five sectional committees with more than three hundred sub-committees, with a membership of over one thousand four hundred individuals at work. The work of this association goes into every branch of industry, but up to date has not included work on safety codes, which is now becoming a considerable part of the work of the American Engineering Standards Committee.

Perhaps the next country in order of importance so far as its accomplishment in the line of standardization is concerned is Germany. The organization here is along a line somewhat simliar to that of the other countries, and during the last few years a great deal has been accomplished which will be of aid to German industry. Of interest to electrical engineers is the fact that in a number of lines standard performances and standard connections have been adopted, so that transformers, for example, of any make will run in parallel with similar transformers of any other make. Voltage taps of all makes are the same.

### International Progress

Very serious efforts are being made to accomplish international standardization in many fields.

**International Electrotechnical Commission.**—The oldest and the most experienced of the international bodies whose primary purpose is industrial standardization is the International Electrotechnical Commission, which was organized in 1906 as an outcome of the meeting of the electrical engineers of the world at the St. Louis Exposition in 1903. The International Electrotechnical Commission consists of national committees in each of twenty-six different countries. The work is done by what is known as advisory committees, and decisions are reached at plenary meetings of the commission which are held from time to time.

The influence of the standards committee of the American Institute of Electrical Engineers has been a considerable factor in the past work of the commission, and the American standards are now in very substantial agreement with the international standards so far adopted by the commission. A recent meeting of the advisory committees was held in Geneva, Switzerland, at which meeting there were twelve nations represented, and a total of more than fifty delegates. The chief subjects discussed at this meeting were the basis of rating for general-purpose motors of the open type, standard transmission voltages, factors involved in the rating of water-cooled transformers, abbreviations, symbols and nomenclature, and standard screw plugs and sockets for incandescent lamps.

# Business Conditions

**A Survey of Important Developments in the Electrical Market Including Data on Production, the Sales Outlook, Credits, Exports, the Metals and Other Conditions Affecting Cost, Supply and Demand**

TAKING the electrical market as a whole, it is seen that jobbers and contractor-dealers are considering with less indifference the certain warnings of manufacturers made two months ago when prices were increasing on a rising market. Although a few price increases were made in the market last week, they are of an easier sort and are due mostly to the labor and raw-material situations. Conditions in the market are said to be of a more healthy state than two months ago, and this is certainly true of six months ago.

## Eastern Sections Are Buying in More Conservative Way

IN THE Eastern sections orders to electrical manufacturers, jobbers and retailers continue to flow in fair volume. Less buoyancy is apparent and commitments are a little more conservative, but widespread agreement exists as to the healthy state of the market.

In executive circles the feeling is general that business will be excellent for the rest of the year at least. The buyer is conservative in attitude, and recent tendencies toward inflation appear to have been checked. Price movements are spotty. An advance in direct-current motors amounting to about 10 per cent was scheduled for the first of the week and fuse plugs rose about 8 per cent last week. Brass dropped about a cent a pound last week and copper softened somewhat. Rail deliveries are below desirable standards, but embargoes are being relaxed and road-truck service is improving.

Manufacturers are working close to capacity. In New England the building contract total for the latest reported week exceeded $8,000,000, the best for this week in two decades. Conferences looking toward settling prevalent disputes in the building industry at Boston were scheduled for this week. Retail sales in the electrical field are in excellent volume, interest in ranges showing response to good merchandis-

## Comparative Prices of Station Supplies

| | Current Price | Four Weeks Ago | One Year Ago |
|---|---|---|---|
| Soft steel bars, per lb. | $0.034 | $0.0326 | $0.0236 |
| Cold finished shafting, per lb. | 0.042 | 0.0406 | 0.1466 |
| Brass rods, per lb. | 0.1850 | 0.1913 | 0.15 |
| Solder (half and half), per lb. | 0.2862 | 0.30 | 0.21 |
| Cotton waste, per lb. | 0.1231 | 0.1231 | 0.104 |
| Washers, cast iron (⅛-in.), per 100 lb. | 4.66 | 4.66 | 4.00 |
| Emery, disks, cloth, No. 1, 6-in. diameter, per 100 | 2.96 | 2.96 | 3.11 |
| Machine oil, per gal. | 0.349 | 0.349 | 0.40 |
| Belting, leather, medium, off list | 42% | 42% | 48⅓% |
| Machine bolts, up to 1-in. x 30-in., off list | 44⅓% | 44⅓% | 62⅓% |

ing methods. Cool weather has hurt the early spring fan trade. Lamps are in enormous demand and hollow ware is moving well. Collections throughout the eastern part of the country are showing an improvement.

## Neglecting Foreign Trade When Domestic Market Is Booming

AFTER having captured considerable foreign trade, American electrical manufacturers are allowing it to get away from them while they cater to the domestic market, which for the present is more attractive. This turn in merchandising is true of most other industries of the United States, reports to the Department of Commerce from a large number of countries indicating that American exporters are neglecting their foreign business to a considerable degree.

Since the war upset the world's trade the average American exporter has been playing the flirt with foreign markets. For a time every attention will be given a foreign buyer and then without warning he will be jilted. Just as the coquette usually ends up an old maid, it is feared that many markets will be lost irretrievably if the present practices continue.

Largely as a result of fortuitous circumstances, the United States has built up an important foreign business. While favorable conditions were responsible for inducing American electrical manufacturers to go into foreign markets, their activities in that connection represent a large investment. Not only is this investment being jeopardized by the present business policies of many exporters, but it is sealing the way against any retracing of steps when domestic demand for electrical products begins to fall off.

Officials of the Department of Commerce are urging that a fair distribution of available stocks be made among all customers. If there is to be any favoritism shown, it should be in favor of the foreign market. American manufacturers and other exporters, it is pointed out, would be well advised in taking a leaf from the German book. Germany, and to a less extent England, fills foreign orders first. These countries are in a position to satisfy their domestic customers later if the latter

## Exports of Lighting Outfits, Batteries, Rectifiers,

(Original data supplied by the Bureau

| | | Self-Contained Lighting Outfits | | Searchlights And Projectors | | Primary—Dry | | Primary—Wet | | Storage | | Transformers | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Power | | Other | |
| | | No. | Dollars | No. | Dollars | No. | Dollars | No. | Dollars | No. | Dollars | No. | Dollars | No. | Dollars |
| 1 | Azores | 7 | 1,102 | 20 | 60 | 24 | 9 | | | | | 1 | 56 | | |
| 2 | Belgium | 18 | 4,241 | | | 21,880 | 5,156 | 3 | 79 | 1,915 | 27,657 | 42 | 63,474 | 71 | 4,379 |
| 3 | France | 45 | 9,356 | 739 | 3,240 | 1,115 | 286 | | | 9,716 | 38,336 | 42 | 592,088 | 293 | 15,740 |
| 4 | Denmark | 13 | 2,596 | 9 | 128 | 150 | 71 | | | 12,902 | 68,256 | 4 | 375 | 2 | 100 |
| 5 | Greece | 31 | 9,346 | | | 1,065 | 176 | | | 2,220 | 15,205 | | | | |
| 6 | Iceland & Faroe Islands | | | | | | | | | | | | | | |
| 7 | Netherlands | 6 | 2,614 | 1,446 | 5,954 | 25,118 | 6,507 | | | 339 | 8,461 | 10 | 1,614 | 145 | 14,274 |
| 8 | Norway | 4 | 1,158 | 8 | 204 | 79,097 | 18,208 | 4 | 16 | 990 | 31,598 | 5 | 48,083 | 18 | 2,671 |
| 9 | Spain | 39 | 13,575 | 199 | 789 | 132,529 | 32,016 | | | 3,200 | 37,826 | 76 | 46,281 | 102 | 3,904 |
| 10 | Sweden | 8 | 828 | 3 | 496 | 29,538 | 6,549 | | | 581 | 10,290 | | | 5 | 229 |
| 11 | Switzerland | | | 3 | 509 | | | | | 26 | 334 | 4 | 17,480 | 20 | 23,034 |
| 12 | England | 140 | 38,041 | 119 | 1,433 | 41,447 | 10,832 | 6 | 16 | 8,596 | 143,263 | 151 | 27,574 | 1,335 | 45,783 |
| 13 | Scotland | | | | | | | | | | | | | 4 | 944 |
| 14 | Canada: | | | | | | | | | | | | | | |
| | Maritime Provinces | 5 | 1,236 | 150 | 2,020 | 1,867 | 1,896 | 903 | 1,030 | 536 | 6,104 | 22 | 1,270 | 47 | 3,824 |
| 15 | Quebec and Ontario | 18 | 5,624 | 336 | 7,191 | 45,640 | 16,645 | 1,430 | 2,940 | 12,876 | 130,445 | 797 | 52,788 | 15,689 | 44,007 |
| 16 | Prairie Provinces | 19 | 5,834 | 204 | 1,885 | 11,784 | 4,326 | 753 | 1,622 | 863 | 16,243 | 115 | 13,524 | 958 | 3,587 |
| 17 | British Columbia and Yukon | 14 | 2,941 | 266 | 5,739 | 8,403 | 3,270 | 115 | 550 | 2,998 | 11,525 | 19 | 606 | 776 | 1,204 |
| 18 | British Honduras | 7 | 6,137 | 12 | 114 | 25,647 | 4,762 | | | 10 | 208 | 21 | 2,402 | 30 | 1,618 |
| 19 | Costa Rica | | | 40 | 203 | 19,230 | 2,965 | | | 32 | 1,064 | 23 | 1,406 | 66 | 1,204 |
| 20 | Guatamela | 2 | 719 | 10 | 204 | 22,632 | 4,485 | | | 176 | 3,328 | 33 | 2,301 | 6 | 15,480 |
| 21 | Honduras | 13 | 10,110 | 34 | 370 | 36,396 | 9,770 | 20 | 6 | 159 | 5,798 | 26 | 2,678 | 55 | 2,771 |
| 22 | Nicaragua | | | | | 13,309 | 3,512 | 104 | 267 | 98 | 1,630 | 6 | 721 | 12 | 2,535 |
| 23 | Panama | 5 | 1,051 | 44 | 1,578 | 29,934 | 5,601 | 45 | 62 | 645 | 13,811 | 10 | 509 | 49 | 1,177 |
| 24 | Salvador | 10 | 4,100 | 8 | 47 | 6,908 | 2,077 | 16 | 85 | 136 | 3,323 | 48 | 3,066 | 41 | 12,813 |
| 25 | Mexico | 86 | 27,658 | 353 | 3,782 | 554,730 | 130,312 | 2,245 | 19,217 | 3,862 | 63,627 | 878 | 232,561 | 8,877 | 48,904 |
| 26 | Newfoundland and Labrador | 1 | 295 | | | 170,074 | 43,104 | 12 | 213 | 410 | 2,418 | 55 | 6,623 | 150 | 1,613 |
| 27 | Bermuda | | | | | 11,408 | 2,426 | | | 1 | 36 | 53 | 5,010 | | |
| 28 | Jamaica | 5 | 1,780 | 4 | 88 | 35,646 | 7,467 | 26 | 432 | 834 | 8,294 | 12 | 1,570 | 14 | 1,091 |
| 29 | Trinidad and Tobago | 6 | 2,618 | | | 23,889 | 5,966 | | | 230 | 4,548 | 5 | 314 | 17 | 1,733 |
| 30 | Other British West Indies | 3 | 982 | 4 | 128 | 14,703 | 4,180 | 60 | 35 | 215 | 8,652 | 2 | 972 | 7 | 676 |
| 31 | Cuba | 28 | 8,183 | 337 | 2,168 | 327,889 | 71,969 | 2,039 | 685 | 3,682 | 49,234 | 355 | 27,744 | 861 | 27,642 |
| 32 | Dominican Republic | 31 | 10,139 | 11 | 239 | 29,316 | 6,463 | 25 | 70 | 613 | 5,784 | 15 | 3,342 | 6 | 154 |
| 33 | Dutch West Indies | | | | | 1,981 | 575 | 5 | 26 | 8 | 163 | 6 | 261 | | |
| 34 | French West Indies | | | | | 633 | 146 | | | 29 | 450 | | | | |
| 35 | Haiti | 3 | 1,118 | | | 8,855 | 1,611 | 4 | 7 | 176 | 3,753 | 8 | 674 | 2 | 55 |
| 36 | Argentina | 48 | 21,040 | 158 | 1,951 | 909,462 | 222,098 | 2,187 | 3,994 | 12,377 | 116,886 | 18 | 5,551 | 3,130 | 9,040 |
| 37 | Brazil | 5 | 1,727 | 454 | 36,986 | 181,521 | 50,447 | | | 3,998 | 56,066 | 1,687 | 96,057 | 1,631 | 41,032 |
| 38 | Colombia | 46 | 15,671 | 25 | 613 | 106,903 | 21,052 | 29 | 157 | 788 | 8,532 | 282 | 27,687 | 55 | 4,405 |
| 39 | Equador | 3 | 897 | | | 12,806 | 2,765 | | | 52 | 1,035 | 28 | 17,986 | 6 | 362 |
| 40 | Bolivia | | | | | 444 | 197 | | | 8 | 501 | 8 | 2,861 | 17 | 1,918 |
| 41 | Chile | | | 12 | 652 | 67,254 | 15,108 | 26 | 146 | 560 | 17,481 | 52 | 117,124 | 225 | 7,370 |
| 42 | Peru | 5 | 1,413 | 19 | 1,103 | 45,017 | 11,680 | 52 | 196 | 285 | 10,701 | 147 | 37,794 | 167 | 7,893 |
| 43 | Venezuela | 32 | 7,961 | 69 | 566 | 91,617 | 16,876 | 430 | 97 | 137 | 2,441 | 159 | 25,392 | 34 | 3,446 |
| 44 | Hongkong | 1 | 685 | 5 | 527 | 58,672 | 11,667 | | | 173 | 3,528 | 172 | 13,356 | 1,160 | 6,194 |
| 45 | Japan | 11 | 5,892 | 131 | 147,991 | 4,105 | 1,550 | 1 | 865 | 1,166 | 28,328 | 897 | 1,416,462 | 1,800 | 88,121 |
| 46 | British India | 45 | 14,791 | 106 | 898 | 111,706 | 24,882 | 51 | 268 | 4,228 | 68,662 | 297 | 128,161 | 529 | 29,227 |
| 47 | China | 3 | 992 | 20 | 1,652 | 62,025 | 14,710 | 18 | 83 | 1,819 | 22,855 | 301 | 158,876 | 1,293 | 36,191 |
| 48 | Philippine Islands | 1 | 1,000 | 566 | 2,633 | 200,711 | 31,676 | | | 1,488 | 44,073 | 65 | 11,435 | 108 | 1,512 |
| 49 | Siam | | | 6 | 400 | 20 | 28 | | | 136 | 12,563 | 60 | 7,159 | 200 | 250 |
| 50 | British West Africa | 3 | 1,398 | | | 262 | 70 | | | 68 | 1,050 | | | | |
| 51 | British South Africa | 22 | 6,811 | 172 | 3,376 | 38,337 | 4,482 | | | 3,857 | 65,218 | 51 | 5,036 | 998 | 10,015 |
| 52 | Australia | 463 | 123,934 | 1,400 | 26,919 | 257,073 | 71,227 | 32 | 285 | 18,318 | 122,945 | 578 | 545,236 | 2,658 | 113,571 |
| 53 | Dutch Guiana | 1 | 70 | | | 1,510 | 470 | | | 29 | 738 | | | | |
| 54 | Turkey in Europe | | | | | 205 | 73 | | | 22 | 408 | | | | |
| 55 | New Zealand | 9 | 2,451 | 27 | 291 | 251,426 | 57,776 | 1,401 | 1,952 | 4,475 | 83,203 | 273 | 45,223 | 1,148 | 54,392 |
| 56 | Italy | 43 | 7,875 | 2 | 28 | 1,363 | 442 | | | 123 | 1,117 | 62 | 38,904 | 67 | 66,345 |

should be displeased with deliveries to them. Concrete information is at hand from a hundred sources to indicate that foreign markets are being neglected by America. The situation applies to all lines and is not confined to the electrical industry. It is regarded as of sufficient seriousness to require the most energetic efforts to effect a remedy while there still is time.

### A Normal Week Is Reported in Chicago

CHICAGO jobbers and dealers report a normal week of electrical business. No important changes in price were announced, except an increase of 7 per cent on 1¼-in x 8-in. standard-grade locust pins and a 5 per cent increase on all wood-top pins. Plug fuses have advanced 6 per cent. High-tension equipment sales are keeping up to their previous standard, manufacturers reporting good business and sales to several large stations being made. Pole-line hardware manufacturers had a good week, with no advance in prices at this time, although one is expected shortly.

Numerous selling drives and advertising campaigns have been started on socket devices, such as flat-irons, vacuum cleaners and washing machines, this week. Dealers state that the sale of these commodities remains about the same, with no exceptional sales reported. Tape manufacturers assert that tape is being bought in considerable quantities and that the price will remain firm until the first of June.

### The Metal Market

COPPER is more steady and is holding its own at the 15.50-cent level. The volume of business transacted during the week was small. The more important producers are virtually out of the market, these selling only an occasional lot to regular customers.

NEW YORK METAL MARKET PRICES

| | May 16, 1923 Cents per Pound | May 23, 1923 Cents per Pound |
|---|---|---|
| Copper, electrolytic | 15.75 | 15.50 |
| Lead, Am. S. & R. price | 7.75 | 7.25 |
| Antimony | 8.00 | 8.00 |
| Nickel, ingot | 28.00-30.00 | 28.00 to 30.00 |
| Zinc, spot | 7.15 | 6.60 |
| Tin, Straits | 45.00 | 43.00 |
| Aluminum, 98 to 99 per cent. | 26.00 | 26.00 to 27.00 |

## Switches, Fuses, etc., from the United States During 1922

(Foreign and Domestic Commerce.)

| Transformers | | Condensers, Double Current and Motor Generators, Dynamotor, Synchronous and Other Converters | | Switchboards and Panelboards, Except Telephone | | Switches and Circuit Breakers | | Lightning Arresters Choke Coils, Reactors and Other Protective Devices | | Fuses and Fuse Plugs | | Metal Conduit, Outlets, and Switch Boxes | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rectifiers | | | | | | | | | | | | | | |
| No. | Dollars | No. | Dollars | No. | Dollars | No. | Dollars | No. | Dollars | No. | Dollars | Pounds | Dollars | |
| | | 2 | 382 | | | 16,105 | 4,493 | 10 | 294 | | | | | Azores |
| 50 | 2,165 | 338 | 5,805 | 16 | 5,912 | 148,537 | 52,985 | 354 | 3,012 | 4,361 | 1,443 | 1,478 | 228 | Belgium |
| 50 | 600 | 1,096 | 29,946 | 3 | 1,482 | 19,550 | 38,393 | 331 | 173,439 | 1,780 | 201 | | | France |
| 14 | 116 | 1 | 25 | | | 2,600 | 1,990 | 100 | 388 | 1,116 | 258 | | | Denmark |
| | | | | | | 21 | 155 | 22 | 171 | | | | | Greece |
| 186 | 3,834 | 26 | 2,308 | 11 | 400 | 1,640 | 2,685 | 6 | 42 | 1,212 | 228 | 142 | 213 | Iceland & Faroe Islands |
| 10 | 144 | 2 | 1,112 | | | 13,322 | 7,731 | 4 | 28 | 6,150 | 423 | 8,124 | 700 | Netherlands |
| 87 | 1,190 | 429 | 1,676 | 40 | 42,198 | 33,679 | 47,291 | 1,411 | 5,073 | 8,606 | 954 | | | Norway |
| | | | | | | 506 | 263 | 31 | 294 | | | | | Spain |
| 4 | 500 | | | | | 8,421 | 23,356 | 1 | 15 | | | | | Sweden |
| 47 | 1,871 | 4,813 | 56,339 | 292 | 32,137 | 86,705 | 73,356 | 1,397 | 10,758 | 30,295 | 7,105 | 993 | 513 | Switzerland |
| 3 | 66 | 1 | 1,455 | 1 | 40 | 34 | 5,938 | 1 | 84 | | | | | England |
| | | | | | | | | | | | | | | Scotland |
| 16 | 1,285 | 23 | 2,702 | 14 | 1,307 | 5,105 | 2,253 | 145 | 418 | 16,924 | 739 | 3,418 | 491 | Canada: Maritime Provinces |
| 16,650 | 22,282 | 3,845 | 55,506 | 728 | 43,484 | 557,528 | 307,892 | 18,798 | 34,105 | 940,750 | 44,185 | 301,700 | 43,480 | Quebec and Ontario |
| 126 | 2,359 | 786 | 4,816 | 38 | 2,125 | 24,706 | 13,581 | 3,029 | 4,070 | 98,583 | 4,820 | 10,420 | 2,036 | Prairie Provinces |
| 24 | 230 | 353 | 3,212 | 323 | 8,483 | 17,151 | 9,563 | 396 | 1,742 | 41,848 | 2,575 | 76,966 | 4,701 | British Columbia and Yukon |
| 1 | 104 | 4 | 174 | 5 | 1,111 | 658 | 438 | 162 | 142 | 2,309 | 438 | 1,390 | 158 | British Honduras |
| 1 | 18 | 243 | 2,873 | 1 | 125 | 1,845 | 1,010 | 27 | 521 | 2,685 | 508 | 905 | 144 | Costa Rica |
| | | | | 2 | 614 | 1,020 | 648 | 91 | 669 | 1,680 | 173 | 107 | 84 | Guatemala |
| 7 | 323 | 23 | 6,692 | 9 | 1,803 | 1,937 | 1,903 | 224 | 494 | 7,752 | 1,246 | 3,473 | 791 | Honduras |
| 1 | 165 | 14 | 244 | 4 | 758 | 799 | 868 | 87 | 678 | 3,199 | 312 | | | Nicaragua |
| 2 | 207 | 544 | 2,072 | 17 | 1,860 | 2,631 | 2,965 | 125 | 852 | 17,406 | 1,411 | 56,272 | 4,172 | Panama |
| 20 | 404 | 2 | 247 | 4 | 847 | 483 | 458 | 43 | 183 | 214 | 103 | 32 | 13 | Salvador |
| 42 | 5,530 | 322 | 61,518 | 1,826 | 115,865 | 67,770 | 97,823 | 2,604 | 19,132 | 156,226 | 19,968 | 307,265 | 24,854 | Mexico |
| 18 | 121 | | | 4 | 640 | 602 | 763 | 66 | 317 | 2,565 | 534 | 6,057 | 946 | Newfoundland and Labrador |
| | | 20 | 30 | 17 | 3,429 | 594 | 1,259 | 50 | 73 | 1,251 | 366 | 12,920 | 1,813 | Bermuda |
| 1 | 15 | 1 | 358 | 8 | 2,482 | 2,302 | 1,598 | 38 | 250 | 7,403 | 755 | 1,177 | 162 | Jamaica |
| 4 | 139 | 3 | 786 | 52 | 414 | 904 | 557 | 77 | 475 | 3,877 | 189 | 387 | 206 | Trinidad and Tobago |
| 48 | 48 | 12 | 7,501 | 20 | 9,862 | 2,116 | 636 | 8 | 41 | 349 | 247 | 87,178 | 10,861 | Other British West Indies |
| 87 | 2,350 | 17 | 16,030 | 96 | 33,444 | 72,872 | 31,925 | 1,878 | 13,644 | 126,565 | 13,509 | 269,968 | 28,877 | Cuba |
| | | 1 | 25 | 13 | 4,617 | 230 | 442 | 25 | 183 | 19,268 | 1,622 | 4,550 | 831 | Dominican Republic |
| | | | | 4 | 395 | 532 | 288 | | | 25 | 4 | | | Dutch West Indies |
| | | 1 | 20 | | | | | | | | | | | French West Indies |
| | | | | 2 | 75 | 443 | 510 | 49 | 443 | 1,550 | 54 | 9,157 | 652 | Haiti |
| 106 | 440 | 105 | 5,130 | 30 | 6,042 | 111,788 | 49,883 | 303 | 2,550 | 147,978 | 19,462 | 221,463 | 20,912 | Argentina |
| 6 | 99 | 108 | 4,638 | 473 | 38,236 | 51,246 | 34,185 | 1,808 | 30,756 | 208,289 | 19,325 | 509,77 | 32,331 | Brazil |
| 2 | 33 | 7 | 2,176 | 21 | 10,266 | 6,494 | 4,233 | 94 | 3,718 | 9,140 | 770 | 14,374 | 1,471 | Colombia |
| | | 202 | 1,131 | 62 | 12,798 | 940 | 394 | 227 | 2,383 | 4,951 | 897 | 24 | 2 | Ecuador |
| 2 | 700 | | | 7 | 1,027 | 1,673 | 2,764 | 14 | 104 | 8,548 | 546 | 2,303 | 194 | Bolivia |
| 58 | 399 | 8 | 161,814 | 39 | 237,960 | 15,675 | 58,375 | 99 | 502 | 29,329 | 3,686 | 170,048 | 9,377 | Chile |
| 6 | 524 | 6 | 851 | 43 | 21,453 | 5,116 | 3,483 | 2,773 | 3,226 | 13,366 | 1,756 | 55,117 | 3,528 | Peru |
| 1 | 76 | 255 | 2,829 | 35 | 10,893 | 10,252 | 1,811 | 867 | 2,166 | 14,969 | 757 | 404 | 222 | Venezuela |
| | | 13 | 271 | 8 | 1,403 | 44 | 113 | | | 14,600 | 2,120 | | | Hongkong |
| 553 | 865 | 22,204 | 258,140 | 17,385 | 1,583,316 | 46,945 | 259,194 | 2,627 | 244,234 | 5,809 | 2,413 | 98,634 | 7,431 | Japan |
| 16 | 628 | 24 | 31,588 | 19 | 75,916 | 1,844 | 37,415 | 804 | 19,335 | 13,709 | 2,313 | 190,776 | 13,363 | British India |
| 34 | 1,283 | 9 | 6,290 | 272 | 57,259 | 65,540 | 77,088 | 515 | 10,520 | 9,915 | 2,626 | 88,848 | 5,995 | China |
| 17 | 370 | 8 | 18,500 | 32 | 15,356 | 33,973 | 13,755 | 621 | 5,016 | 9,160 | 1,779 | 62,437 | 5,832 | Philippine Islands |
| | | | | 1 | 65 | 71 | 701 | 1 | 287 | 50 | 5 | | | Siam |
| | | | | | | 150 | 48 | | | | | | | British West Africa |
| 21 | 727 | 23 | 27 | 121 | 6,475 | 3,373 | 15,299 | 1,661 | 2,178 | 25,400 | 2,128 | 4,695 | 347 | British South Africa |
| 181 | 3,531 | 106 | 410,020 | 303 | 232,791 | 231,242 | 525,260 | 4,421 | 38,459 | 59,935 | 15,466 | 195,042 | 51,318 | Australia |
| | | | | | | | | 76 | 384 | | | | | Dutch Guiana |
| | | | | | | 1,000 | 495 | | | | | | | Turkey in Europe |
| 52 | 1,174 | 87 | 8,018 | 19 | 9,946 | 21,222 | 27,289 | 1,095 | 30,892 | 9,927 | 6,432 | 415 | 304 | New Zealand |
| 16 | 216 | 348 | 18,056 | 8 | 1,296 | 807 | 5,137 | 163 | 689 | 6,303 | 500 | 1,295 | 811 | Italy |

## April National Delinquent Accounts Were Fewer

FIVE of the six territories reporting for April to the National Electrical Credit Association announce a smaller number of delinquent accounts over March, 1923, and April, 1922. In the Chicago central division section the April, 1923, accounts numbered 794, against 993 for March, 1923, although the average amount for this same period was $139.96, against $131.49 for March, 1923. New York reported 422 delinquent accounts, against 460 in April, 1922, but the average amount increased $28 per account.

Philadelphia's account went from 232 for April, 1922, to 241 in April 1923, but lowered the average amount from $148.51 to $145.60. In both the New England and the Pacific Coast territories the number of accounts for March and April this year has been decreasing. The total number and amount of delinquent accounts follow:

DELINQUENT ACCOUNTS IN APRIL

| Branch and Month | Number of Delinquent Accounts Reported | Total Amount | Average Amount |
|---|---|---|---|
| Central Division: | | | |
| March, 1922.. | 978 | $98,569.53 | $100.79 |
| March, 1923.. | 993 | 130,571.90 | 131.49 |
| April, 1922.. | 799 | 87,991.88 | 110.13 |
| April, 1923.. | 794 | 111,130.28 | 139.96 |
| New York: | | | |
| March, 1922.. | 643 | 72,843.00 | 113.00 |
| March, 1923.. | 584 | 73,655.00 | 126.00 |
| April, 1922.. | 460 | 56,616.00 | 123.00 |
| April, 1923.. | 422 | 63,771.00 | 151.00 |
| Philadelphia: | | | |
| March, 1922.. | 277 | 28,095.09 | 101.42 |
| March, 1923.. | 204 | 26,386.27 | 129.34 |
| April, 1922.. | 232 | 34,454.70 | 148.51 |
| April, 1923.. | 241 | 35,099.19 | 145.60 |
| New England: | | | |
| March, 1922.. | 129 | 11,170.85 | 86.59 |
| March, 1923.. | 60 | 4,782.71 | 79.71 |
| April, 1922.. | 68 | 7,128.00 | 104.82 |
| April, 1923.. | 44 | 7,979.04 | 181.34 |
| Pacific Coast: | | | |
| March, 1922.. | 18 | 2,681.95 | 148.09 |
| March, 1923.. | 48 | 7,522.26 | 156.92 |
| April, 1922.. | 25 | 3,594.67 | 143.50 |
| April, 1923.. | 39 | 8,444.75 | 216.53 |

# Activities of the Trade

Devoted to News of the Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

## Westinghouse Electric Earns Twice Its Dividends

The net income of the Westinghouse Electric & Manufacturing Company for the year ended March 31, 1923, was $12,263,485 as shown by the company's annual report. The dividend requirements were $6,033,428, so that over twice this amount was earned and more than $6,000,000 added to the surplus. Gross sales for the year were $125,000,000, which represents an increase of $25,000,000 over the sales of last year. The cash position of the company is a strong one, the current assets totaling over $106,000,000 and the current liabilities less than $17,000,000.

"The bookings of new business steadily increased during the year," states Guy E. Tripp, chairman of the board of directors, "and the value of unfilled orders at the close of the year was $61,914,237, as compared with $50,740,696 at the close of the previous year.

## Three Important Western Jobbers Consolidate

The Wesco Supply Company, St. Louis, wholesalers of electrical goods, has purchased the business of the Electric Supply Company, Memphis, and the Gulf States Electric Company, New Orleans. The Wesco Supply Company has recently increased its capital to provide funds for the purpose of purchasing these two companies.

J. L. Buchanan, president of the Wesco Supply Company, will continue as president of the company and will be in active charge of the St. Louis property. W. R. Herstein, vice-president of the Electric Supply Company, will become vice-president of the Wesco Supply Company and will be in charge of the properties in Memphis and New Orleans.

The three properties will be operated as separate and independent units and there will be no change in personnel of office, warehouse or traveling forces. All three will remain General Electric distributors and will continue to handle the products of those manufacturers to whom their respective trades have become accustomed. With slight modifications of territorial limits, so as to conform to economic shipping conditions, the only result of the consolidation will be a common ownership, a greatly increased purchasing power and a stock-interchange arrangement which will give customers the benefit of all three warehouse stocks.

## Warner Elevator Expands

The Warner Elevator Manufacturing Company has completed a large addition to its plant at Cincinnati which gives it a main shop length of 500 ft., 200 ft. in width, two stories and basement. This addition, it is said, makes this the second largest factory in the world for the exclusive manufacture of electric passenger and freight elevators.

A traveling crane in the new south wing connects the railroad spur with the main bay and eliminates most of the trucking to and from the freight cars. A rather unusual problem was recently solved when the 165-ft. elevator test tower was moved bodily to a new location to avoid interference with the main crane track.

## Trumbull-Vanderpoel and Plainville Agreement

The Plainville Electrical Products Company, Plainville, Conn., has entered into an agreement with the Trumbull-Vanderpoel Company, Bantam, Conn., manufacturer of electrical switches, etc., to take over the business which the latter company had on its books covering switchboards and panelboards only.

The Trumbull-Vanderpoel Company has discontinued the manufacture of switchboards and panelboards and is now devoting its entire facilities to the manufacture of inclosed switches and switch parts.

The statement in the ELECTRICAL WORLD of May 12, saying, "The growth of the inclosed-switch business of the Trumbull-Vanderpoel Company has led to an agreement with the Plainville Electrical Products Company whereby the latter will assemble and market this portion of the Bantam company's output," is therefore in error.

## Combustion Engineering Plants at Full Production

New plants of the International Combustion Engineering Corporation are at full production and earnings are in excess of $1,000,000 annually. Business since the first of the current year has been at record figures, both in this country and abroad, the monthly average being in excess of $1,000,000. It is said that this increase is not due entirely to recent developments in burning coal in pulverized form, but also to the fact that business in mechanical stokers is larger than ever.

Business so far in May indicates that the company is having the largest month in its history. Unfilled orders on hand are in excess of $7,000,000, sufficient to keep plants busy at capacity for a full year.

## New Copper and Brass Wire Mill for Anaconda Company

The American Brass Company, subsidiary of the Anaconda Copper Company, has started work on a new mill at the Kenosha (Wis.) branch for the production of copper and brass wire. This mill will constitute a new department at this plant.

The building will be of brick and steel, two stories, 200 ft. x 600 ft., estimated to cost $600,000.

## Pelton Water Wheel Order

The Pacific Gas & Electric Company has awarded a contract to the Pelton Water Wheel Company for furnishing three 48-in. butterfly valves for installation at its Coleman power house. The working head for each of these valves is 470 ft., and they will be equipped for both hand operation and electric motor operation.

The electrical equipment is also arranged for remote control.

## Pittsburgh Transformer Company Making Extensive Additions

A survey of the expansion program now being carried out by the Pittsburgh Transformer Company, Pittsburgh, shows an addition, 80 ft. x 120 ft., being constructed to the Adams Street plant; additional property purchased for a new plant, replacing the old Bayard Street plant, covering an entire city block, contracts for which have been let and started, and property purchased at Metropolitan and Juniata Streets costing $24,000, which will be used for extensions.

When these improvements are completed the company will occupy four city blocks, three blocks covered by its own buildings, and the fourth block, consisting of the River plant, being occupied under lease. The new buildings will be of steel construction with glass sides and buff-brick trimmings of the same general appearance as the Juniata plant.

## Apex Appoints European Manager and Educational Director

Among the recent important appointments made by the Apex Electrical Distributing Company, manufacturer of home appliances, Cleveland, are those of A. L. Zollner as European sales representative and R. E. Palmer as educational director.

Early this month Mr. Zollner sailed for London, where he will establish his headquarters. He was formerly sales manager in foreign countries for the Singer Sewing Machine Company and director of the Willys Export Corporation's activities in the Far East.

Mr. Palmer is at work on a standard form of education for the company's retail salesmen and also a special course for teaching field managers their duties. It is planned to have these courses arranged in time for the company's Cleveland convention, after which it is intended to place a standard course in effect in all the large cities.

## National Conduit Financing Plan

The protective committee representing the holders of the first-mortgage 6 per cent ten-year bonds of the National Conduit & Cable Company has announced that it has received an offer from a responsible party to buy all of the bonds deposited with the National City Bank at a price of $700 net cash for each $1,000 bond. The committee, which consists of Charles E. Mitchell, James H. Perkins and W. O. Gay, has sent a letter to all holders of the bonds outlining the terms of the offer. An extract from the statement of the committee says:

"The undersigned committee has received an offer from a responsible party to buy all first-mortgage 6 per cent ten-year sinking-fund gold bonds of the National Conduit & Cable Company, Inc., which are deposited with the National City Bank of New York, 55 Wall Street, New York City, on or before Tuesday, June 5, 1923, at 70 cents on the dollar of principal, without interest; that is, at $700 net cash for each $1,000 bond, with the coupon due Oct. 1, 1921, and all subsequent coupons attached, payable at said bank, in New York funds, on or before June 20, 1923, provided that if less than 70 per cent in amount of the total issue of said bonds should be deposited with said bank on or before said fifth day of June, 1923, the party making the offer will have the right either to purchase at same price the amount of bonds which has been deposited or to withdraw the offer and refuse to take any bonds."

## Western Electric at Tacoma, Wash., Moves to Larger Quarters

The Western Electric Company at Tacoma, Wash., has recently acquired a new location, moving from 762 Commerce Street to 1511 "A" Street, where full stocks are carried. This new location contains about 2,500 sq.ft. with trackage facilities. The new quarters are up to date in every detail. According to F. N. Cooley, sales manager of the Seattle office, the outlook for electrical business in the Pacific Northwest territory is extremely good and the total year's business should be approximately 60 per cent above that of 1922.

## Granby Consolidated Absorbs Allenby Copper

At a meeting of the directors of the Granby Consolidated Smelting and Power Company last week the company took over control and 90 per cent ownership of the Allenby Copper Company. At the same time D. C. Jackling, August Heckscher, W. H. Coverdale and H. G. Moulton were elected directors of Granby.

The Allenby Copper Company has $800,000 cash in its treasury and General Manager Munroe will immediately start active operations at the Allenby property. Granby is producing close to 3,000,000 lb. of copper a month. Operations at Allenby will add about 20,000,000 lb. a year, making a total annual output of both companies somewhat over 50,000,000 lb. of copper a year.

Col. J. T. Crabbs was elected president of the company to succeed W. H. Nichols.

## General Electric April Business Estimated at $31,000,000

General Electric bookings of new business for the month of April are estimated at $31,000,000. Since Jan. 31 bookings have been at an annual rate of approximately $360,000,000.

Bookings for the first quarter of 1923 were $80,010,045. General Electric entered the current year with approximately $76,000,000 of unfilled orders, which means that, with business booked since Jan. 1, the company had to date approximately $190,000,000 of new business to work on. In the first four months of 1923 goods billed were running at an average of about $20,000,000 a month.

**The Electric Lamp Lock Company**, Kalamazoo, Mich., recently organized to manufacture locking devices for electric light service, is considering plans for the establishment of a plant, estimated to cost about $80,000. The company's products have recently been made at the plant of the Grubber & Smith Manufacturing Company, Jackson, Mich., A. M. Grubber of the latter organization is president of the new company.

**The Connecticut Telephone & Electric Company, Inc.**, Meriden, Conn., announces the appointment of James A. Bennett as sales manager. He succeeds Charles E. Stahl.

**The Gleason-Tiebout Glass Company**, 200 Fifth Avenue, New York City, reports several important orders for its lighting equipment, among which is a large shipment to the new million-dollar high school building in Ottumwa, Iowa, and to the Standard Oil Company of New Jersey's new office building at Baltimore.

**The Walker Vehicle Company**, State and Eighty-seventh Streets, Chicago, manufacturer of electric trucks, announces the removal of its Atlanta office, P. C. Pomeroy in charge, from 926 Hurt Building to 1012 Atlanta Trust Building.

**The Hoover Suction Sweeper Company**, North Canton, Ohio, reports its April business as record-breaking. Volume of shipments during the first two weeks of May indicates that May will show a 20 per cent gain over April.

**The Johns-Manville Company** is moving its big plant out of Milwaukee to Waukegan, Ill. The company has dismantled its machinery and is moving it to the Illinois plant and will allow the Milwaukee buildings to remain idle for the present. This company employs upward of three thousand men and expects to take the majority of its employees with it to the new location.

**The Dryden Rubber Company**, Chicago, announces the appointment of H. E. Lavelle as direct factory representative in Eastern territory for its insulating-tape department. Headquarters are at 15 Park Row, New York City.

**The Gibb Instrument Company**, Bay City, Mich., manufacturer of electric welding equipment, has been appointed distributor of the General Electric Company's arc-welding electrodes in the Middle West.

**The South Norwalk Electric Works**, South Norwalk, Conn., plan to build a two-story addition in the near future.

**The Peterson Storage Battery Company**, 323 South Lafayette Street, South Bend, Ind., has awarded a contract for a one-story addition to cost $30,000.

**The Domestic Electric Company**, 43 Warren Street, New York City, has acquired a portion of the building at 21 Murray Street, under lease, for the establishment of a new works.

## Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

An agency is desired in Panama (No. 6,487) for radio receiving apparatus and small lighting and power plants operated by internal-combustion engines.

An agency is desired in San Juan, Porto Rico (No. 6,478), for lighting fixtures, etc.

An agency is desired in Cape Town, South Africa (No. 6,481), for household electrical appliances, etc.

An agency is desired in Panama (No. 6,482) for electrical materials used in building construction.

The following inquiries have been received by the Philadelphia Commercial Museum, which will furnish names and addresses of the inquirers to any one desiring them and mentioning the number given: A party in Durango, Mexico (No. 40,677), desires information concerning a moving-picture projector and generator to supply electricity for same and for from six to eight lamps. Representation is desired in Havana, Cuba (No. 40,678), for refrigerating and ice-making machinery. Parties in Popayan, Colombia (No. 40,687), desire pamphlets and literature covering small electric motors, lighting plants driven by water power, water-power machinery and also all kinds of electrical supplies and accessories and raw and prepared mica. Parties in Maracaibo, Venezuela (No. 40,649), are desirous of making connections with manufacturers of electrical supplies, automobile supplies, etc. Parties in Turin, Italy (No. 40,653), would like to represent American manufacturers of filaments for incandescent lamps, carbon filaments, tungsten wire and rods, molybdenum wire and rods, borated copper-clad wire and discontinuous tungsten coils for ½-watt lamps. A party in St. Martin, French West Indies, would like to receive catalogs and prices on ice-making and refrigerating machinery, moving-picture machines, telephone and telegraph material, etc. An agency is desired in Santa Clara, Cuba (No. 40,693), for electric lighting fixtures, incubators and brooders, ventilators, etc. A firm in Osaka, Japan, would like to get in touch with manufacturers of electrical apparatus, motor cars, farming tools, etc.

THE GENERAL SUGAR COMPANY, Havana, Cuba, operating thirteen large sugar estates, would like to receive catalogs from manufacturers of sugar-mill machinery, including steam-boiler plants; electrical machinery, including motors, generators; also equipment for power plants, railroad supplies, including locomotives, etc.

PROPOSED ELECTRIC SYSTEM FOR HUTT VALLEY, NEW ZEALAND.—The proposal of the Hutt Valley Electric Power Board to appropriate £200,000 for the installation of an electric system in the Hutt Valley district has been approved by the ratepayers in the district. Energy to the amount of 2,000 kva. is to be supplied from the hydro-electric plant at Mangahao.

## New Apparatus and Publications

WASHING MACHINE. — The Turbax Corporation, 54 West Twenty-first Street, New York City, has developed a washing machine "Turbax," which can be placed in a stationary tub, wash boiler or bathtub.

SAFETY-SWITCH TERMINAL COVER. —The Square D Company, Detroit, has brought out a new porcelain safety-switch terminal cover.

WASHING MACHINE.—A new washing machine, "Hydro-Vac," has been placed on the market by the Altorfer Brothers Company, Peoria, Ill.

VERNIER ADJUSTER. — The Walbert Manufacturing Company, Chicago, has developed a new vernier adjuster, known as the "Univernier."

VACUUM CLEANER. — A new electric vacuum cleaner, the "Magnetic House Cleaner," has been brought out by the Birtman Electric Company, Department M-32, Chicago.

ELECTRIC GLUE POT. — The Rohne Electric Company, 2434 Twenty-fifth Avenue South, Minneapolis, has placed on the market an electrically heated glue pot, known as "Sta-Warm."

WIRE INSULATION STRIPPER. — A tool for stripping the insulation from the ends of electric wires where connections are to be made, known as the "Bard-Parker" wire insulation stripper, has been developed by the Bard-Parker Company, Inc., 37 East Twenty-eighth Street, New York City.

INSULATION TESTER.—James G. Biddle, 1211-1213 Arch Street, Philadelphia, has issued pocket manual No. 1010, entitled "Concerning Insulation Testing with Special Reference to the Meg."

TRIPLEX AMMETER. — The Roller-Smith Company, 233 Broadway, New York City, is distributing bulletin No. 30, describing its triplex ammeter for three-phase alternating circuits, recently developed by the company.

WOOD PIPE. — The Continental Pipe Manufacturing Company, Seattle, Wash., has issued catalog No. 18, entitled "Continental Pipe Used the World Over," which describes and illustrates its products, including wire-wound wood pipe, continuous-stave wood pipe, "creo-wood" flume, etc.

ELECTRIC HOME REFRIGERATOR.— An electrical air refrigerator, "Odin," a new development of refrigeration, has been brought out by the Automatic Refrigerating Company, Inc., Hartford, Conn.

## New Incorporations

THE HAW CREEK WATER & LIGHT COMPANY, Haw River, N. C., has been incorporated with a capital stock of $10,000 to supply water and electricity in Haw Creek Valley and Argo Gardens and vicinity. The incorporators are George W. Craig, Robert H. Brown and Garland A. Thompson.

THE CUSTER COUNTY ELECTRIC COMPANY, Westcliffe, Col., has been incorporated with a capital stock of $25,000 by C. B. Beardsley, George L. Beardsley and Lee C. Mercier.

THE CORTEZ (COL.) LIGHT & POWER COMPANY has been incorporated by Robert W. Bryce, E. E. Johnson and A. A. Cowling. The company proposes to install and operate an electric plant in Cortez.

# Construction News

**Projects, Plans, Bids and Contracts, Contemplated or Under Way**

## New England States

PHIPPSBURG, ME.—Plans for the proposed feldspar grinding plant to be built by the Basin Quarries, Inc., Portland, to cost about $65,000, include a power house.

BOSTON, MASS.—The Boston Elevated Railway Company contemplates the construction of an electric power plant at 696 East First Street, to cost about $200,000.

HOLYOKE, MASS. — The Farr Alpaca Company has plans for a one-story power plant at its mill and will take bids at once. S. M. Greene Company, 293 Bridge Street, Springfield, Mass., is architect and engineer.

HOLYOKE, MASS.—The Holyoke Water Power Company is planning to install an electric generating plant of from 3,600 hp. to 4,000 hp. at the No. 2 overflow. The installation will be of the automatic type.

MIDDLEBORO, MASS.—Plans are being prepared for the construction of a municipal hydro-electric plant, at the Mattock dam, to cost about $35,000. H. M. Merrill & Company, Boston, are engineers.

MERIDEN, CONN. — Plans are under consideration for extensions to the Connecticut Schools for Boys, including a power house to cost $50,000; building for laundries, $150,000, and dormitory building, $150,000. E. S. Boyd is superintendent.

## Middle Atlantic States

GLENS FALLS, N. Y.—The Fort Miller Pulp & Paper Company will install electric power equipment in connection with the rebuilding of the portion of its plant recently destroyed by fire.

NEW YORK, N. Y.—The Texas Company, 17 Battery Place, plans to install electric power equipment in connection with the erection of additional units at its oil-refining plant in Wyoming, to cost about $2,000,000.

PHILADELPHIA, N. Y.—The Antwerp (N. Y.) Light & Power Company contemplates a hydro-electric development of 1,000 hp., under 60-ft. head, on the Indian River here, to cost about $150,000. The work will include a dam, power house, tailrace and generating equipment.

ROCHESTER, N. Y.—Staub & Son, Inc., have plans for a one-story power house at their plant.

HACKENSACK, N. J.—Bids will be received by the Hackensack Improvement Commission until June 4 for construction of sewers and pumping equipment, including three electrically operated sewage-pumping stations, together with pumping equipment, etc. The pumping equipment is to consist of A. B. Wood patent trash pumps, motors and switchboards to be of General Electric or other approved make. Lemuel Lozier is engineer of the commission.

KEARNEY, N. J.—Plans are being prepared by the J. G. White Engineering Corporation, 43 Exchange Place, New York City, for a power plant for the local works of the Western Electric Company. Post office address is Arlington.

KEYPORT, N. J.—The Monmouth Lighting Company has been granted permission to issue $200,000 in bonds and $60,000 in capital, part of the proceeds to be used for extensions and improvements.

MORRISTOWN, N. J.—The Jersey Central Power & Light Corporation, recently organized to merge the Morris & Somerset Electric Company, Morristown, Lakewood & Coast Electric Company, Lakewood, and the Commonwealth Electric Company, Summit, contemplates extensions and improvements in the power plants and systems.

NEWARK, N. J.—Electric power equipment will be installed at the plant of the Celluloid Company, 290 Ferry Street, in connection with extensions to cost $130,000.

WALDWICK, N. J.—The Waldwick Coal & Lumber Company is planning to rebuild its power plant and mill, recently destroyed by fire with loss of about $115,000.

DAUPHIN, PA.—J. H. Bucher and W. H. Schubert are organizing the Conewago-Dauphin Electric Company and the Londenderry-Dauphin Electric Company, to install and operate transmission and distribution systems in Dauphin County.

ERIE, PA.—The City Council contemplates the installation of three high-tension and low-tension conduit systems in State and Liberty Streets and the Cherry Street subway, to cost about $28,500. F. G. Lynch is city engineer.

JOHNSTOWN, PA.—The Clarion River Power Company has plans for the construction of its proposed hydro-electric plants on the Clarion River, at Piney, Foxburg and Mill Creek. The Piney station will have a capacity of 44,000 hp., Foxburg of 85,000 hp. and Mill Creek 130,000 hp.

LYKENS, PA.—The East Penn Electric Company has applied for permission to acquire the system of the Lykens Valley Light & Power Company. Negotiations are under way for the purchase of the Pine Grove Electric Company, Pine Grove. Extensions and improvements will be made.

NEW CASTLE, PA.—The Shenango Pottery Company plans to install electric power equipment in connection with a plant addition to cost about $80,000.

PERKASIE, PA. — The Pennsylvania Power & Light Company is negotiating for the local municipal electric plant. It is proposed to convert the plant into a substation.

PHILADELPHIA, PA.—The Philadelphia Rapid Transit Company plans to remodel its Mount Vernon power plant for a substation.

PHILADELPHIA, PA.—Plans are being prepared by the Water Bureau for a power house and electrically operated pumping plant at Richmond Street and Wheatsheaf Lane.

PITTSBURGH, PA.—The West Virginia Power & Transmission Company has been granted permission by the Federal Power Commission to build hydro-electric plants on the Cheat River and plans will be prepared at once for the first station. The cost of the project is estimated at about $75,000,000, including power transmission lines. The present plans provide for a total development of 600,000 hp.

POTTSVILLE, PA.—The Philadelphia & Reading Coal & Iron Company, Philadelphia, plans to install a power plant at its Reevesdale Colliery. The coal mining plant will be electrified.

POTTSVILLE, PA. — Plans are under way for a merger of eighteen electric companies operating in Metal, Lurgan, Beale, Lack, Tell, Dublin, Clay, Milford, Tuscarora, Cromwell, Springfield, Letterkenny, Tod, Fannett, Bratton, Woodbury and Granville Townships. The consolidation will include extensions in the power plants and systems and the ultimate merger with the Penn Central Light & Power Company.

READING, PA.—The Metropolitan Edison Company plans to build a substation at Carsonia, near here.

SALEMVILLE, PA. — Electric power equipment will be installed by the Keystone Coal & Coke Company in connection with the rebuilding of its coal washery and coking plant, recently destroyed by fire, causing a loss of about $100,000.

SCRANTON, PA.—The Scranton Electric Company plans to increase the output of its electric power plant by 25,000 kw. at a cost of about $1,800,000. Additional transmission lines will be erected.

BALTIMORE, MD.—Bids will be received by the Board of Awards, at the office of the City Register, City Hall, Baltimore, until May 31 for furnishing and erecting two 8,000,000-gal. motor-driven centrifugal pumps and electrical equipment for the Druid pumping station, Water Department. William A. Megraw is water engineer.

BALTIMORE, MD.—The Standard Sanitary Manufacturing Company, Bessemer Building, Pittsburgh, Pa., has engaged Samuel Diescher & Sons, Farmers' Bank Building, engineers, to prepare plans for its proposed new local plant and power house, to cost about $2,500,000.

ELKTON, MD.—The Circuit Court has authorized the North Maryland Electric Company to acquire the property of the Gilpin Falls Electric Light Company, Elkton. Extensions and improvements will be made.

HAGERSTOWN, MD.—The Water Commission is considering the installation of electrically operated pumping machinery and auxiliary equipment in connection with extensions and improvements to the waterworks system, to cost about $2,000,000.

MASON, W. VA.—The Hutchinson Coal Company contemplates rebuilding its power plant recently destroyed by fire, causing a loss of about $70,000.

TIOGA, W. VA.—The Cochran Coal Company plans to install additional electric power equipment at the plant of the Bear Run Coal Company, recently acquired.

WASHINGTON, D. C. — The Potomac Electric Power Company has issued $4,000,000 in bonds, part of the proceeds to be used for the construction of an electric generating plant.

## North Central States

BATTLE CREEK, MICH.—The installation of ornamental lamp standards on Chestnut Street is under consideration.

UNION CITY, MICH.—The Village Council has authorized Holland, Ackerman & Holland, consulting engineers, to prepare plans for the installation of a new municipal electric distributing system.

WATERVLIET, MICH.—Electric power equipment will be installed in the plant of the Watervliet Paper Company.

YPSILANTI, MICH.—The Ford Motor Company contemplates the construction of a power house in connection with its plant here for the manufacture of tractors, automobiles, etc., to cost about $1,000,000.

CLEVELAND, OHIO. — The Cleveland Electric Illuminating Company is asking for bids for a substation to be erected at the foot of East 170th Street, to cost about $750,000. J. C. Spencer, Engineers' Building, is engineer; E. J. Cook, Illuminating Building, is architect.

DOVER, OHIO.—Extensions to the municipal electric light plant are under consideration by the City Council.

LIMA, OHIO—Electric power equipment will be installed at the proposed new lubricating-oil plant at the works of the Lily White Oil Company, recently acquired by the Roxana Petroleum Company, Kansas City, Mo.

LOUISVILLE, KY.—The Kentucky Utilities Company, Marion E. Taylor Building, plans to erect a 33,000-volt transmission line from Rockport to Eckols, to supply electricity to the coal mines at Eckols, to cost about $30,000. The company contemplates erecting a transmission line from Lancaster to Richmond (33 miles), to cost about $150,000. G. T. Bogart is engineer.

OWENSBORO, KY. — Electric power equipment will be installed at the new plant to be built by the Owensboro Clay Products Company.

INDIANAPOLIS, IND.—Extensions and improvements will be made in the electric plants and system of the Indianapolis & Cincinnati Traction Company, to cost about $250,000.

JEFFERSONVILLE, IND. — The Interstate Public Service Company has acquired the property of the Jeffersonville Water, Light & Power Company. Plans are under way for extensions and improvements.

KANKAKEE, ILL.—Plans are being prepared by the Public Service Company of Northern Illinois for the construction of a dam and hydraulic power station at Aroma Park on the Kankakee River, about 4 miles from Kankakee.

CHIPPEWA FALLS, WIS. — The City Council is considering the construction of a municipal electric light plant and dam at the Brunet dam site.

GREEN BAY, WIS. — The Wisconsin Public Service Corporation plans to erect a 5-mile transmission line from High Falls to Ellis Junction. Bids, it is understood, will be asked for the work. Mead & Seastone, Journal Building, Madison, are engineers.

MILWAUKEE, WIS.—Bids will soon be asked for the installation of an ornamental street-lighting system in Shorewood, to cost about $85,000. A. J. Sweet, 531 Grand Avenue, is engineer.

MILWAUKEE, WIS.—The construction of a maintenance building to serve the power plant and other buildings and equipment of the Jones Island sewage disposal plant, now under construction, is under consideration by the Metropolitan Sewerage Commission. The building with equipment will cost about $200,000 and will contain a machine shop. John H. Fowles is secretary of the commission.

WILLMAR, MINN.—The City Council is considering the installation of a light plant in conjunction with the waterworks system, to cost about $150,000. Cory & Le Coque, Aberdeen, S. D., are architects and engineers.

BOLIVAR, MO. — Improvements to the municipal electric light system are under consideration. A. T. Archer & Company, New England Building, Kansas City, are engineers.

CARROLLTON, MO.—The Kansas City (Mo.) Power & Light Company has applied to the Public Service Commission to reconstruct and operate the transmission line from Carrollton to Glasgow.

FULTON, MO.—Bonds to the amount of $50,000 have been voted, the proceeds to be used to complete the water and light plant.

LEBANON, MO.—The Missouri Water Power Company is preparing plans for the construction of four hydro-electric power plants on the Niangua River, with total capacity of about 15,000 hp.

ST. LOUIS, MO. — The Columbia Can Company plans to build a power plant in connection with its new works in the Northwest industrial district, to cost about $500,000.

SWEET SPRINGS, MO.—A special election will soon be called to vote on the proposal to sell the municipal electric light plant to the Kansas City Light & Power Company.

BEULAH, N. D.—The installation of a large electric power plant to supply electricity to a number of towns and villages in this section is under consideration by the Beulah Electric Company.

DEVILS LAKE, N. D.—The Mid-West Power Company contemplates erecting a high-tension transmission line from here to Carrington, a distance of 45 miles, to cost about $55,000.

GENEVA, NEB.—The Blue River Power Company has submitted a proposal to the City Council offering to furnish electricity to the city and to build a distributing plant, to cost about $50,000.

## Southern States

CHARLOTTE, N. C.—The Ornamental Stone Company, 129 Brevard Court, contemplates the construction of a power house in connection with a proposed artificial stone plant, to cost about $70,000.

MICAVILLE, N. C.—The North State Feldspar Company, recently organized, plans to install a power plant in connection with a proposed feldspar mill, to cost about $100,000.

SOUTHERN PINES, N. C.—The Southern Pines Warehouses, Inc., contemplates the construction of a power house in connection with a planing mill and mechanical works.

WALNUT COVE, N. C.—A bond issue of $100,000 has been sold, the proceeds to be used for a municipal electric plant.

SAVANNAH, GA.—The Savannah Lighting Company, recently acquired by Mills B. Lane and associates, is being reorganized. Plans are under way for extensions and improvements to the property.

ORLANDO, FLA.—A bond issue of $630,000 is planned, the proceeds to be used for a municipal electric plant and waterworks system.

SEBRING, FLA.—The Light and Water Department will soon ask for bids for equipment for a municipal electric light and power plant.

NASHVILLE, TENN. — The Tennessee Electric Power Company has issued $2,500,000 in bonds, part of the proceeds to be used for extensions and improvements.

SPRING HILL, TENN.—The City Council is considering the installation of an electric lighting system. Electricity will be furnished by the Southern Cities Power Company.

ATTALLA, ALA.—The Alabama Company will construct an electric power house in connection with the rebuilding of its mining properties recently destroyed by fire, with loss of about $100,000.

SAMSON, ALA.—The Pea River Power Company, Troy, has purchased the local light and water plant. Improvements will be made to the system, to cost about $22,000. A transmission line will be erected from Opp to Samson.

HATTIESBURG, MISS.—Plans for the proposed new mills to be built by the Clyde Lumber Company near Quitman, to cost about $150,000, include an electric power house.

JACKSON, MISS.—The Faust Brothers' Lumber Company will build a power house at its proposed new mill here, to cost about $125,000.

LECOMPTE, LA.—Bids will be received by the Mayor and Board of Aldermen until June 12 for improvements to the electric light and waterworks plant, including two crude-oil engines directly connected to alternators, switchboard, motor-driven air compressor, motor-driven domestic service pump, 8-in. water well, 125,000-gal. concrete reservoir, concrete foundations, new power station, etc. Swanson-McGraw, Inc., United Fruit Building, New Orleans, is engineer.

NEW ORLEANS, LA.—The Todd Dry Docks & Construction Corporation, 25 Broadway, New York, will build a power house in connection with its local drydock and shipbuilding plant, to cost about $2,000,000, with equipment.

BARNSDALL, OKLA. — Electric power equipment will be installed at the oil refinery of the Barnsdall Refining Company in connection with extensions to cost about $200,000.

OKLAHOMA CITY, OKLA.—The Oklahoma Gas & Electric Company has purchased a controlling interest in the Shawnee (Okla.) Gas & Electric Company. It has also acquired the Oklahoma Light & Power Company, Ada, and the Southern Oklahoma Power Company, Byng. The plants will be improved and the transmission lines extended for an interchange of service. New lines will be built.

PAULS VALLEY, OKLA.—The Oklahoma Light & Power Company contemplates erecting a transmission line from its plant at Byng to Pauls Valley, which will eventually be extended to Wynnewood.

PRYOR, OKLA.—The Public Service Company of Oklahoma, Tulsa, has petitioned the City Council for a franchise to supply electricity in Pryor. Under the terms of the proposed franchise the company would take over the city light and ice plant and erect a transmission line to Vinita to supply energy for local service.

DALLAS, TEX.—The Dallas Power & Light Company will soon break ground for a power plant on Griffin Street, to cost about $400,000.

DALLAS, TEX.—Electric power equipment will be installed in the ice-manufacturing and cold storage plant of the Columbia Manufacturing Company, recently acquired by the Southern Ice & Utilities Company.

DEPORT, TEX.—An election will be held May 26 to vote on the proposal to issue $18,000 in bonds to construct a municipal electric light plant.

EL PASO, TEX. — Wells, Stillwell & Spears, Inc., contemplate the installation of a power plant in connection with a proposed cotton-oil mill, to cost about $130,000.

FORT WORTH, TEX.—The Texhoma Oil & Refining Company, Wichita Falls, plans to build a power house in connection with a new gasoline refining plant, to cost about $500,000.

SPEARMAN, TEX.—Bonds to the amount of $12,000 have been approved for the installation of an electric light plant.

## Pacific and Mountain States

NORTH BEND, ORE.—Improvements are contemplated by the Mountain States Power Company, including the construction of a new power house at the Smith mill, to cost about $200,000.

PENDLETON, ORE.—The Pacific Power & Light Company, Portland, plans to build a new local substation, with transmission lines to Kennewick, Wash., to cost about $350,000.

PORTLAND, ORE. — Arrangements are being made by the Portland Railway, Light & Power Company to appropriate $12,000,000 for the construction of its proposed hydro-electric plant in the vicinity of Oak Grove, including transmission lines.

EXETER, CAL.—Plans for the proposed cement manufacturing plant, to be built by John F. Hamburg and associates, to cost about $2,000,000, include an electric power plant.

LOS ANGELES, CAL.—The City Council plans to install an ornamental lighting system on Hollywood Boulevard.

SAN FRANCISCO, CAL.—The installation of an ornamental lighting system on Geary Street in connection with widening of the street is planned.

SAN FRANCISCO, CAL. — The Pacific Gas & Electric Company plans to build a substation in the Vara district, to cost about $100,000, and also one in Berkeley, to cost $65,000.

SAN FRANCISCO, CAL. — The Pacific Gas & Electric Company has secured a fifty-year license from the Federal Power Commission for the Mount Shasta Power Corporation, a subsidiary, for Pit No. 3 unit and a preliminary permit for two and one-half years for Pit No. 4 unit for the same company, both projects being on Pit River. These projects include a storage reservoir, created by a 100-ft. dam and a 4-mile pressure tunnel, to supply water to a 99,000-hp. plant, operating under a head of 307 ft. Below this plant a diversion dam with a 3-mile pressure tunnel will be built to supply a second power house of 53,000 hp. Electricity will be transmitted by a 220,000-volt transmission line through the Hat Creek plants to Cottonwood. Three more plants are contemplated on the Pitt River.

SANTA CRUZ, CAL.—The installation of an ormental lighting system in the business district is under consideration. James K. James is city engineer.

CANANEA, ARIZ. — The Las Chispas Mines Company, Arizpe, plans to build a power plant at its properties, to cost about $200,000.

## Canada

VANCOUVER, B. C.—Preparations are being made by the British Columbia Electric Railway Company for the erection of a transmission line from West Vancouver to Britannia Beach, a distance of 25 miles. The proposed line will supply electricity to the mines of the Britannia Mining & Smelting Company, which has contracted for about 5,000 hp.

WOODSTOCK, N. B.—The power house of the Woodstock Electric Railway, Light & Power Company was recently carried down the St. John River by a flood.

AMHERST, N. S.—A bylaw to secure hydro-electric power from the Economy River will be submitted to the rate payers.

CLIFFORD, ONT.—The rate payers have proposed a bylaw authorizing the construction of an electric light plant at Elora.

TIMMINS, ONT.—The Northern Canada Power Company contemplates building a hydro-electric plant at Ka-Ka-Ke Rapids on the Des Quinze River, where it is estimated that 100,000 hp. can be developed. The initial development, it is understood, will be about 20,000 hp. The cost of project is estimated from $3,000,000 to $4,000,000. Vielé, Blackwell & Buck, 49 Wall Street, New York City, are engineers.

ST. LAMBERT, QUE.—Improvements are contemplated to the electric lighting system, including a new intake to the power house.

SHERBROOKE, QUE. — A bylaw has been approved by the rate payers authorizing improvements to the gas and electric systems to cost about $125,000.

# Electrical Patents

**Announced by U. S. Patent Office**

(Issued May 1, 1923)

1,453,529. COMPOUND REGULATING SET FOR INDUCTION MOTORS; W. Seiz, Baden, Switzerland. App. filed Nov. 3, 1921. Auxiliary equipment enables speed control of induction motors above and below synchronism.

1,453,555. ELECTROMAGNET AND CONTROL THEREFOR; G. E. Stack, Ballston Spa, N. Y. App. filed Dec. 21, 1920. Control operation of circuit magnetically.

1,453,574. ELECTRIC WATER HEATER; Z. Trotzer, Budapest, Hungary. App. filed Nov. 1, 1921. Used in direct connection with water supply pipes.

1,453,584. DEVICE FOR AMPLIFYING TELEPHONE CURRENTS AND OTHER ELECTRIC OSCILLATIONS; J. Blankenburg, Berlin, Germany. App. filed June 17, 1919. Armature of a magnetic system coupled to microphone.

1,453,590. PLUG-RECEIVING WALL OUTLET; W. S. Mayer, Philadelphia, Pa. App. filed June 22, 1921.

1,453,595. MANUFACTURE OF INCANDESCENT ELECTRIC LAMPS AND SIMILAR ARTICLES; L. E. Mitchell and A. J. White, Cleveland, Ohio. App. filed Aug. 3, 1920. Tipless lamps.

1,453,602. LIQUID-LEVEL INDICATOR; D. R. Price, Newtonville, Mass. App. filed Feb. 13, 1920. Electrically indicating levels at points remote from liquid.

1,453,612. SELECTIVE RECEIVER; R. L. Williams, Newton, Mass. App. filed Nov. 8, 1917. For receiving signals transmitted under water.

1,453,640. ELECTRIC HEATER FOR WASHING MACHINES; C. P. Russell, Brandon, Manitoba, Canada. App. filed Jan. 7, 1922. Heating element placed in bottom of reciprocating plunger-type washer.

1,453,682. RHEOSTAT; L. Kebler, Bronxville, N. Y. App. filed Dec. 20, 1920.

1,453,699. METHOD FOR SEPARATING MAGNETIC MATERIALS; O. Brophy, Philadelphia, Pa. App. filed Sept. 28, 1921. Heating of metals renders one temporarily non-magnetic.

1,453,724. GRID LEAK; E. L. Powell and C. E. Motto, Washington, D. C. App. filed June 26, 1922. Construction of grid leak having permanent characteristics.

1,453,774. HIGH TENSION CUT-OUT SYSTEM AND THE LIKE; F. C. Van Etten, Chicago, Ill. App. filed Jan. 9, 1920. Method of mounting equipment on transformer poles.

1,453,791. POST AND COVER CLAMP AND SEAL; W. E. Gossling, New York, N. Y. App. filed July 30, 1920. For storage-battery terminal.

1,453,793. ELECTRICAL CONNECTION; V. C. Hamister, Cleveland, Ohio. App. filed June 30, 1921. Pigtail for carbon brushes.

1,453,794. ELECTRIC LIGHT FIXTURE; J. W. Hancock, Denver, Col. App. filed April 18, 1922. Globe-inclosing bulb is combined with reflector.

1,453,817. ELECTRIC COUPLING FOR CARS; H. H. Westinghouse, New York, N. Y. App. filed July 5, 1918.

1,453,821. TELEPHONE SYSTEM; G. A. Yanochowski, Chicago, Ill. App. filed June 20, 1921. Automatic ringing systems.

1,453,827. ELECTRIC LAMP SOCKET; R. B. Benjamin, Chicago, and P. D. Phillips, Elmhurst, Ill. App. filed April 21, 1920. Method of locking lamp in socket.

1,453,829. RHEOSTAT; G. W. Camp, Mount Vernon, N. Y. App. filed Jan. 10, 1921. Theater dimmer.

1,453,832. ELECTRIC HEATER; E. C. Donaldson, Highland Park, Mich. App. filed Nov. 22, 1920. Heating appliance that can be used like a hot-water bottle.

1,453,858. POWER-DEVELOPING APPARATUS; H. F. Schmidt, Pittsburgh, Pa. App. filed July 21, 1910. Combination of two Diesel engines, one generator and two motors for three-screw propeller drive.

1,453,860. ATTACHMENT DEVICE FOR ELECTRIC FIXTURES; J. E. Watson, Philadelphia, Pa. App. filed May 26, 1922. Auxiliary connection for other units.

1,453,888. SPIRIT LEVEL; W. E. Winner and C. C. Patterson, Lowell, Mass. App. filed Feb. 16, 1921. Electrically lighted.

1,453,889. TIRE VULCANIZER; E. J. Rohne, Minneapolis, Minn. App. filed Jan. 8, 1921. Electrically heated and controlled by thermostat.

1,453,911. AUTOMOBILE SIGNAL; N. Browne, Chelan, Wash. App. filed March 26, 1920. Rear direction signal.

1,453,980. ATTENUATION EQUALIZER; R. S. Hoyt, Brooklyn, N. Y. App. filed June 29, 1918. System for telephonic transmission of speech.

1,453,982. ELECTRICAL RECEIVING OR REPEATING APPARATUS AND METHOD OF OPERATING THE SAME; B. W. Kendall, New York, N. Y. App. filed Sept. 13, 1915. Repeaters for submarine cables.

1,454,005. REGULATING TRANSFORMER; N. Wenzel, Twin Falls, Idaho. App. filed Feb. 10, 1921. System of dimming theater lights.

1,454,011. SYSTEM FOR ATTAINING UNIFORM ATTENUATION; O. B. Blackwell, Garden City, N. Y. App. filed June 29, 1918. Transmission system over which telephonic or multifrequency signals are transmitted.

1,454,017. REEL; M. P. Holmes, Claremont, N. H. App. filed Nov. 20, 1916. Gathering reel for mining machines.

1,454,022. THERMALLY CONTROLLED SWITCH; G. H. Whittingham, Baltimore, Md. App. filed July 10, 1922. For starting and stopping alternating-current motors.

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1,454,030. RHEOSTAT; R. B. Austrian, New York, N. Y. App. filed July 14, 1922. Electron tube-filament resistor.

1,454,033. CHARGING RACK; F. T. Baird, Blue Island, Ill. App. filed Oct. 24, 1921. For electric cells or batteries.

1,454,056. ELECTRIC TOASTER; H. Kruesheld, New Washington, Ohio. App. filed March 20, 1922. Sides turned by knot placed on top.

1,454,078. STORAGE-BATTERY ELECTROLYTE; E. J. Rueb, Oklahoma, Okla. App. filed Jan. 28, 1921. Electrolyte composed of two ounces of aluminum-potassium sulphate per pint of hard water.

1,454,085. ELECTRIC INDICATOR FOR VIBRATIONS OF THE AIR; E. A. Sperry, Brooklyn, N. Y. App. filed Jan. 27, 1917. Consists of long slender gas flame affecting sensitive electric apparatus.

1,454,092. SYSTEM OF ELECTRICALLY TRANSMITTING SIGNALS; H. E. Warren, Ashland, Mass. App. filed April 15, 1918. Range signaling for battleships.

1,454,123. ELECTRICALLY OPERATED OIL CUP; R. R. McClure, San Francisco, Cal. App. filed Oct. 20, 1921. Remote-controlled.

1,454,137. SYNCHRONIZED MACHINE GUN FOR AIRPLANES; O. A. Ross, New York, N. Y. App. filed Sept. 14, 1918.

1,454,147. LIGHT SUPPORT; T. G. Berman, Antigo, Wis. App. filed Sept. 8, 1920. Movable arm supports socket and shade.

1,454,157. PHONOGRAPHIC RECORDING AND REPRODUCING SYSTEM; H. C. Egerton, Ridgewood, N. J. App. filed July 19, 1918. Electromagnetic reproducing and recording means with amplifier.

1,454,158. MEANS FOR RINGING OVER MULTIPLEX TRANSMISSION CHANNELS; L. Espenschied, Hollis, N. Y. App. filed July 29, 1919. Means whereby ringing and other signals may be transmitted for each carrier channel.

1,454,159. MEANS FOR RINGING OVER MULTIPLEX TRANSMISSION CHANNELS; L. Espenschied, Queens, N. Y. App. filed July 30, 1920. Employs carrier currents.

1,454,166. INSULATION-SMOOTHING DEVICE; J. A. Heany, New Haven, Conn. App. filed April 10, 1919. For wires having rectangular cross-section.

1,454,195. PHONOGRAPH MOTOR; E. J. Tomlinson, Newark, N. J. App. filed May 20, 1920. Motor directly on record table shaft.

1,454,219. OZONE GENERATING APPARATUS; R. Goedicke, Berlin-Schöneberg, Germany. App. filed Feb. 28, 1920.

1,454,247. DESK STAND; R. H. Manson, Rochester, N. Y. App. filed March 12, 1920. Telephone stand for automatic system.

1,454,289. LIGHTNING ARRESTER; L. M. Klauber, San Diego, Cal. App. filed Dec. 3, 1919. Resistance type.

1,454,296. CONTACT RAIL FOR ELECTRIC TRACTION; H. Parodi, Paris, France. App. filed June 15, 1922. Protecting guard placed over rail.

1,454,307. RADIO TELEGRAPHY; A. L. Anderson, Palo Alto, Cal. App. filed Dec. 23, 1919. Single-wave radio signaling system.

1,454,328. RECEIVING ARRANGEMENT FOR WIRELESS TELEGRAPHY; A. Messner, Berlin, Germany. App. filed Sept. 3, 1921. Energy transformed and amplified in cathode relay.

1,454,359. TERMINAL FOR ELECTRICAL APPLIANCES; C. H. Werenskiold, Brooklyn, N. Y. App. filed Nov. 4, 1919. For batteries, spark plugs, etc.

1,454,425. RADIATOR AND PROCESS OF PRODUCING SAME; I. S. Chapman, Venice, and C. E. Mort, Rialto, Cal. App. filed July 11, 1921. Electrically deposited metal binds ends of tubes together.

1,454,448. ELECTRIC KETTLE; C. de C. Matulich, Henley Beach, South Australia. App. filed Aug. 22, 1922.